SAN JOAQUIN VALLEY PIPELINE

DRAFT
ENVIRONMENTAL IMPACT REPORT/ ENVIRONMENTAL IMPACT STATEMENT

SEPTEMBER 1986

PREPARED FOR:
CALIFORNIA STATE LANDS COMMISSION
AND
BUREAU OF LAND MANAGEMENT,
OF THE
DEPARTMENT OF THE INTERIOR

PREPARED BY:
ECOLOGY AND ENVIRONMENT, INC.

SCH NO. 85122307/ SLC NO. 405

California State Lands Commission

and

Bureau of Land Management, Department of the Interior

Draft

Environmental Impact Report/ Environmental Impact Statement for the proposed San Joaquin Valley Pipeline Project

Prepared by:

Ecology and Environment, Inc.

Prepared For:

State Lands Commission and Bureau of Land Management

September, 1986

State Clearinghouse No. 85122307

Contract No. C-8575

State Lands Commission No. 405

Interior DES 86-39

Claire Dedrick, Executive Officer, State Lands Commission

Acting

Edward Hastey, California State Director
Bureau of Land Management

September 1986

NOTICE OF PUBLICATION/PUBLIC HEARING
ON A DRAFT JOINT ENVIRONMENTAL IMPACT REPORT/
ENVIRONMENTAL IMPACT STATEMENT

Pursuant to Section 15085(d), Title 14, California Administrative Code, the National Environmental Policy Act, and 40 CFR 1500, this is to advise that a Draft EIR/EIS has been prepared for the State Lands Commission and the Bureau of Land Management for the proposed project described below:

Project Title:	San Joaquin Valley Pipeline
Project Location:	Weir Station, Kern County, to Shell refinery at Martinez, Contra Costa County.
Project Description:	The San Joaquin Valley Pipe Line Company proposes to construct a 258-mile buried pipeline and ancillary facilities to transmit heated crude oil from the oil fields in the southern part of the San Joaquin Valley in Kern County to the existing Shell refinery at Martinez in Contra Costa County, at a rate of 120,000 barrels per day.

Contact Person:	John B. Lien	Telephone: (916) 322-7805
	Ed Lynch	Telephone: (805) 861-4191

The document is identified as SLC EIR 405, State Clearinghouse Number 85122307. A copy of the document may be obtained from:

John B. Lien
State Lands Commission
1807 - 13th Street
Sacramento, California 95814

Ed Lynch
Bureau of Land Management
800 Truxtun Ave., Rm. 302
Bakersfield, California 93301

Written comments should be received by John B. Lien at the State Lands Commission office no later than close of business on November 24, 1986.

PUBLIC HEARINGS

Public hearings on the draft document will be held at the following times and locations:

Date	Location
November 6, 1986	Kern County Library Southwest Branch 8301 Ming Ave. Bakersfield, CA 93311 (two hearings: 2 p.m. - 4:30 p.m. and 7 p.m. - conclusion)
November 17, 1986	Board of Supervisors Hearing Room Contra Costa County Administration Bldg. 651 Pine Street Martinez, CA (two hearings: 2 p.m. - 4:30 p.m. and 7 p.m. - conclusion)

Anyone interested in this matter is invited to comment on the document by written response or by personal appearance at any of the hearings.

C O V E R   S H E E T

SAN JOAQUIN VALLEY PIPELINE PROJECT

(X) DRAFT | () FINAL

Joint Review Panel

California State Lands Commission
Sacramento, CA (CEQA Lead)

U.S. Department of the Interior
Bureau of Land Management (NEPA Lead)

Comments on this EIR/EIS should be directed to:

John B. Lien
State Lands Commission
1807 - 13th Street
Sacramento, California. 95814
(916) 322-7805

Date by Which Comments Must be Received: November 24, 1986

ABSTRACT

The San Joaquin Valley Pipe Line Company proposes to construct a 258-mile pipeline that will transport 120,000 barrels per day of local crude oils from the southern San Joaquin Valley to the Shell Oil refinery in Martinez, Contra Costa County. The pipeline would extend along the western region of the San Joaquin Valley from the Weir station in Kern County through Kings, Fresno, Merced, Stanislaus, San Joaquin, and Alameda counties to Contra Costa County. The pipeline diameters will increase over the length of the route from 10.75 inches to 18 inches to 24 inches, and the pipeline will be buried at a depth of about 5 feet. Existing booster and injection station facilities at McKittrick station, Kernridge station, Mid station, Kettleman station, and Caliola station will be used and modified where necessary, and an additional booster station will be built in Fresno County and in Stanislaus County, along with a communication system of microwave relay facilities and an 80,000-barrel storage tank at Mid station. If approved, construction is scheduled for 1987 and 1988.

The San Joaquin Valley Pipeline Project Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) addresses the applications to construct the pipeline, booster stations, and ancillary facilities from the Weir station in Kern County to Martinez in Contra Costa County.

The EIR/EIS analyzes the environmental effects of the proposed pipeline; two new booster stations; and microwave and ancillary facilities including the 80,000-barrel storage tank for the various phases of the project, i.e., construction, operation, accidents, and abandonment. This report also analyzes the impacts of two routing alternatives, an alternative booster station configuration, two alternative power configurations, and alternative overhead aqueduct crossings.

The routing alternatives include two sections which are near the proposed route. One of these follows Interstate Highway 5 (I-5) in Fresno County more closely than the proposed route, while the other avoids to a greater extent an area with topographical and soils constraints in Contra Costa County that is crossed by the proposed route. The alternative booster station configuration is based on three new booster stations (one more than the proposed system) in Fresno, Merced, and San Joaquin counties, which could be implemented with an alternative 20-inch pipeline as well as the proposed 24-inch pipeline, and which will have greater throughput efficiency. Alternative power configurations include electric motors instead of the proposed gas turbines to drive the pumps and either crude oil or natural gas-fired heaters to heat the oil. The proposed project includes, in addition to six underground crossings, two overhead crossings on existing suspension bridges across the California Aqueduct and Delta Mendota Canal, whereas the alternative would make all eight crossings of the aqueduct system on suspension bridges.

The EIR/EIS has been prepared according to the requirements of the National Environmental Policy Act of 1969 (NEPA); the Council of Environmental Quality's regulations for implementing NEPA, effective July 30, 1979; and the California Environmental Quality Act (CEQA) as amended. Based on the issues and concerns identified during the scoping process, the EIR/EIS focuses on the impacts to river crossings, access, hydrology, restoration, employment, and oil spills.

TABLE OF CONTENTS

Table of Contents (Cont.)

Table of Contents (Cont.)

Table of Contents (Cont.)

Table of Contents (Cont.)

Table of Contents (Cont.)

Table of Contents (Cont.)

LIST OF ILLUSTRATIONS

List of Illustrations (Cont.)

LIST OF TABLES

List of Tables (Cont.)

List of Tables (Cont.)

List of Tables (Cont.)

List of Tables (Cont.)

List of Tables (Cont.)

EXECUTIVE SUMMARY

Introduction

The San Joaquin Valley Pipeline Environmental Impact Report/Environmental Impact Statement (EIR/EIS) is issued jointly by the California State Lands Commission (SLC) and the U.S. Department of the Interior's Bureau of Land Management (BLM). The intent of the document is to fulfill the requirements of both the California Environmental Quality Act (CEQA) (under which SLC is the lead agency for this project) and the National Environmental Policy Act (NEPA) (under which BLM is the lead agency).

The proposed project includes the construction of a heated, buried crude oil pipeline and associated facilities, to transport 120,000 barrels per day (120 MBD) from existing oil fields in Kern County, California, to existing refining facilities in Martinez, Contra Costa County, California. The project sponsor, or applicant, the San Joaquin Valley Pipe Line Company (SJVPLC), is an affiliate of the Shell Oil Company. SJVPLC proposes to build this pipeline through the western San Joaquin Valley in order to transport the 120 MBD in a reliable, cost-effective manner. Shell currently transports 120 MBD from its Kern County oil fields to Martinez through exchange agreements involving a privately owned pipeline. The proposed action, therefore, will not in itself increase the production or refining of California crude oil.

Once a right-of-way across state and federal lands has been granted and the required permits and authorizations have been obtained for the project, the pipeline will be built in four segments, with pipe diameters ranging from 10.75 to 24 inches, for a total length of about 258 miles. In a generally northwest direction from Kern County, each segment will be built using a larger diameter pipe than the previous segment, to accept and transport the cumulative inputs from producing fields in the southern portion of the San Joaquin Valley. From its origin at Weir station in Kern County, the project will parallel Interstate Highway 5 (I-5) through Kings, Fresno, Merced, Stanislaus, and San Joaquin counties. The pipeline will then proceed through the northeast corner of Alameda County and eastern Contra Costa County, before turning west along Suisun Bay, into the existing Martinez refinery.

The pipeline, planned for construction between mid-1987 and mid-1988, will follow existing pipeline and utility corridors for about 88% of its length, or 228 miles. Other project components include the construction of two new booster (pumping and heating) stations, the construction of 13 new microwave communication towers, and the modification of four of six existing booster and oil injection stations.

In addition to the proposed project, this EIR/EIS evaluates two minor alignment alternatives, an alternative booster station configuration, two alternative booster station power source configurations, an overhead aqueduct crossing alternative, and the no-project alternative. The Combination Route diverges from the proposed pipeline north of Lost Hills, California, and extends for about 44 miles. Major parts of this route alternative follow the proposed route; and at no point does it diverge more than 2 miles from the proposed route. This route is considered because, as a whole, it follows I-5 more closely than the corresponding portion of the proposed route and, thus, intrudes slightly less upon undisturbed land. The Contra Loma Route diverges from the proposed route for a 3.5-mile stretch near the City of Pittsburg in Contra Costa County. It avoids areas of potential landsliding in this part of the county.

The three new booster station alternative (as compared to two new booster stations in the proposed action) is analyzed because it could allow greater operational flexibility over Segment 4 of the pipeline (Fresno County to Martinez); with this alternative, oil could be pumped and heated more efficiently, and a 20-inch or 24-inch pipe could be used over Segment 4 (Segment 4 of the proposed action is limited to the use of a 24-inch pipe).

The alternative power source configurations consist of electricity, rather than natural gas, to power the pumps, and either crude oil or natural gas, rather than the use of waste heat with natural gas backup, to heat the oil. These alternate configurations are proposed for analysis because they might be more economical than the proposed action.

The overhead aqueduct crossing alternative would substitute aerial crossings at six different portions of California Water Project and Bureau of Reclamation canals for the underground crossings proposed in the project for these points. This alternative would allay concerns that the California Department of Water Resources has expressed about underground crossings of its aqueducts.

Other alternatives to the various components of the proposed action were analyzed and eliminated from detailed analysis. Such alternatives included about a dozen routing variations, six of which were within Contra Costa County. In addition, two major route alternatives were analyzed at a conceptual level, one route along the eastern edge of the San Joaquin Valley, and another that crossed the Coastal Ranges and approached Martinez through the Santa Clara Valley. Other alternatives that were ultimately rejected included fiber-optic cables as a line communications medium, pipeline insulation, and alternative transportation means for the crude oil, involving a combination of truck, rail, and tanker transport.

SJVPLC has applied for right-of-way permits from BLM to cross federal land, and from SLC to cross land owned by the State of California. Because of its length and the resources it could potentially affect, the pipeline will require numerous other federal, state, and local permits before construction can begin.

Areas of Controversy

Based on public input, scoping meetings, and agency responses to the Notice of Preparation circulated by SLC, several areas of controversy associated with the proposed action have been identified. The first is the potential for an oil spill at some point along the 258-mile pipeline over the life of the project, and the effects which a spill could have on water resources, terrestrial and aquatic biological resources, and adjacent land uses. The other area of controversy is the potential for impacting such rare, threatened, or endangered species as the San Joaquin kit fox, the blunt-nosed leopard lizard, and others, as well as the potential for reducing these species' critical habitats.

The question of oil spill potential is particularly controversial because of crude oil pipeline spills that have occurred over the past several years between Los Angeles and Martinez and because of the frequent seismic activity in the region. Statistics show that pipeline spills are rare, especially spills from new pipelines, and they are not often due to natural causes. Based on statistical probabilities, it is estimated that over the life of the project there would be three spills over 50 barrels, and six spills of between 5 and 50 barrels. However, despite the elaborate system safety and reliability measures associated with the proposed action, oil spills could occur over the life of the project due to impact damage or defective or corroded pipe. A wide variety of impacts could occur depending upon the location, volume, and timing of an oil spill. The concerns are surface water and groundwater pollution, damage to nearby biological resources, habitat destruction, temporary loss of agricultural/rangeland productivity, and degradation of scenic vistas. However, the most significant impact would be realized if a major spill reached reservoirs or aqueducts and contaminated these water supplies for Los Angeles and for irrigated agriculture.

Along the pipeline route, areas of controversy include pipeline construction through sensitive biological areas such as critical habitat for the blunt-nosed leopard lizard, salt marsh harvest mouse, giant kangaroo rat, and San Joaquin kit fox, and the Hoover's wooly star and Congdon's eatonella. Because the U.S. Fish and Wildlife Service (USFWS) considers these animals endangered and is likely to designate these two plant species as threatened or endangered, intensive field surveys of these species were conducted as a condition of project approval. The results of these surveys have been integrated into this document.

Major Impact Conclusions

The proposed route is generally aligned for much of its length within existing utility and transportation corridors. As a result, the project has no impacts which cannot be reduced by mitigation, and only a few impacts which remain significant after mitigation. Construction, operation, accident and abandonment impacts of the proposed project are described in Chapter 4. Mitigation measures are described in Chapter 6. Table S-1 (at the end of this summary) identifies the potentially significant impacts, their corresponding mitigation measures, and the residual impacts that would result from the mitigated action. The mitigation measures listed in the table are referenced by the same numbers used in Chapter 6. Residual impacts remaining after mitigation are classified as either significant or not significant. The significant residual impacts include the following:

For Construction:

- The total land requirement of almost 1,000 acres for permanent right-of way and ancillary facilities; and

- Localized revegetation problems or failure on slopes steeper than 18% (about 80 sites).

For Operation:

- The small probability of consequences from an exceptionally strong seismic event (greater than MMI VIII), which could result in a major spill and spill-related impacts to environment resources.

For Accidents:

- Any spill greater than 5 barrels, or any spill to water.

Comparison of Alternatives

This document evaluates four project alternatives, any of which may be implemented independently of the others. This discussion briefly summarizes the advantages and disadvantages of each alternative compared to the aspect or portion of the proposed action that it would replace.

Other than the no-action alternative, the proposed route does not have an alternative that would constitute a distinctive and completely different alternate to the proposal. The reason is that the proposed route has been aligned to avoid the rugged terrain of the Coastal Ranges as much as practicable while also avoiding highly productive agricultural land and irrigation systems in the San Joaquin Valley. For this reason, the proposed route crosses a multitude of toe slopes on the border between valley and foothills. While this is not environmentally desirable, any route farther west of the valley would encounter more difficult topographic constraints. On the other hand, the proposed route does follow existing transmission and transportation corridors to a large extent.

The route alternatives, or deviations, consist of the Combination Route and the Contra Loma Route. The Combination Route would follow existing rights-of-way slightly more closely than the corresponding portion of the proposed action, even though the separation between the two routes is very small (less than 2 miles). Because the Combination Route would add about 0.5 miles to the length of the pipeline, it would have slightly higher construction and operation costs. The Contra Loma Route would avoid landslide areas in a small portion of Contra Costa County, but it would pass through existing residential areas, unlike the segment it would replace, and therefore could create more difficult right-of-way and permit conditions.

The three new booster station alternative would achieve project objectives more economically because it would allow more efficient sizing and operation of pumps and heaters. It would also allow a 20-inch pipe to be installed over Segment 4, reducing the maximum potential oil spill over this segment. This alternative has similar environmental impacts as the proposed configuration.

The alternative power source configurations could also result in more economical operation of the pipeline, depending on the prices of natural gas, crude oil, and electricity. These alternative power configurations would use more energy than the proposed method, and in addition, will cause significantly higher air emissions if crude oil were to be burned as a source of heat.

Overhead aqueduct crossings would be a preferable method of crossing California Water Project canals compared to the proposed underground techniques, according to the California Department of Water Resources. They would also be less expensive. The disadvantages of these overhead crossings are that they would expose the pipeline to external damage, possibly causing spills into the aqueducts, and they are visually intrusive compared to underground crossings.

Agency Preferred Alternative

Under NEPA, the federal lead agency must identify its preferred alternative for projects for which an EIS is prepared. The preferred alternative stated below is not a final agency decision, but it is an indication of the federal agency's preliminary preference. The alternative identified below is preferred by BLM, the federal lead agency.

The federal agency's preferred alternative is the proposed action as described in this document. There is no corresponding requirement under CEQA that the CEQA lead agency identify its preferred alternative at the Draft EIR stage.

Table S-1

SUMMARY OF SIGNIFICANT IMPACTS FOR THE
SAN JOAQUIN VALLEY PIPELINE PROPOSAL

Resource Area		Impact Area	Significance of Potential Hazard or Impact S	Significance of Potential Hazard or Impact NS	Mitigation Measure	Effectiveness	Residual Impact Significance S	Residual Impact Significance NS
GEOLOGY AND TOPOGRAPHY								
Construction	1.	Unique geological features	--	NA†	--	NA†	--	--
	2.	Commercial resources	--	X	--	NA†	--	X
	3.	Paleontological resources	--		See Paleontology below	--		
	4.	Topographical modifications; requirement to cut steep slopes, particularly in Contra Costa County	X	--	See Soils below	Original contours and slopes will be restored as much as possible	--	X
	5.	Requirement for occasional blasting of hard rock	--	X	2, 6	Noise from blasting or risks to nearby construction crews will be minimized	--	X
Operation		None identified	--	--	--	--	--	--
GEOLOGICAL HAZARDS								
Construction		None identified	--	--	--	--	--	--
Operation	6.	Potential pipeline rupture at Pacheco Creek	X	--	4, 65, 7	Response action to a spill if one occurs at the Concord Fault will be accelerated	X[2]	--
	7.	Need for special engineering design studies required to enhance safety of:						

Table S-1 (Cont.)

Resource Area	Impact Area	Significance of Potential Hazard or Impact S	Significance of Potential Hazard or Impact NS	Mitigation Measure	Effectiveness	Residual Impact Significance S	Residual Impact Significance NS
GEOLOGICAL HAZARDS (Cont.)							
	a) The pipe at Concord Fault	X	--	1, 4	Reduced potential for rupture due to maximum potential earthquake and fault movement (up to 3 feet laterally)	X	--
	b) Stability of storage tank at Mid station due to intense ground shaking or liquefaction	X	--	5	Reduced potential for damage to ancillary facilities	--	X
	8. Buoyancy and pipe instability in water-saturated zone (brackish marsh deposits)	--	X	3	The pipe will be prevented from floating and/or working its way to the surface	--	X
SOILS							
Construction	9. Pipeline sited on landslide prone areas	--	X	9	Pipeline stability is enhanced; risk of exposure is minimal	--	X
	10. No rehabilitation and revegetation within one growing season due to the following factors:					--	--
	a) Accelerated erosion and deposition due to sloping and steeply sloping terrain, particularly in Contra Costa County	X	--	8, 9, 10, 11, 12, 15, 16, 66, 67	These measures will restrict the impact to the sites having most severe limitations (e.g., slopes >18% and associated drainages)	X	--
	b) Salinity or alkalinity	X	--	8, 13, 15, 16	Saline soils will be rehabilitated and revegetated with adapted plant species	--	X

Table S-1 (Cont.)

Resource Area	Impact Area	Significance of Potential Hazard or Impact S	NS	Mitigation Measure	Effectiveness	Residual Impact Significance S	NS
SOILS (Cont.)							
	11. Reduced productivity due to horizon mixing and compaction, ponding of agricultural land	--	X	8, 16, 17	Original productivity will be restored on the right-of-way	--	X
Operation	12. Potential recurrent erosion problem on steep slopes and associated drainages	X	--	10, 14, 15	Right-of-way maintenance including erosion control, where necessary will be implemented in perpetuity	X*	
SURFACE WATER							
Construction	13. Degradation of water quality below beneficial use criteria, due to any of the following factors:					--	--
	a) Excessive disturbance in-stream and of the adjacent banks and land causing erosion and sedimentation	--	X	18, 23, 21	Silt loads are reduced	--	X
	b) Release of hydrostatic test water and/or trench dewatering	--	X	19, 20, 24	Hydrostatic test water releases will be controlled to avoid scour and water quality degradation	--	X
	c) Spill and fuel leaks	--	X	22	No oil will reach surface water resources	--	X
	14. Stream bed alterations and scouring, and damage to aquatic habitat	--	X	18, 21, 68	Aquatic life will only be subject to short-term effects; there will be no significant change in the stream beds	--	X

*In Alameda and Contra Costa counties.

Table S-1 (Cont.)

Resource Area		Impact Area	Significance of Potential Hazard or Impact S	NS	Mitigation Measure	Effectiveness	Residual Impact Significance S	NS
SURFACE WATER (Cont.)								
	15.	Construction of structures in 100-year flood zones	--	x	21	Pipeline stability is ensured in the case of an unusual flood	--	X
	16.	Reductions in surface water volume	--	NA†	NA†	NA†		NA†
Operation	17.	As for (14) above	X	--	68, 69	Scour will be prevented and risk of exposure of the pipeline will be reduced	--	X
	18.	Oil spills	X	--	70	Measure will reduce size of spill and spill impacts	X(2)	--
GROUNDWATER								
Construction		None identified						
Operation	19.	A measureable reduction in water quality in an aquifer, due to major spill which is contained and cleaned up	--	X	100	If a spill occurs, it will not reach aquifers due to spill response	--	X
	20.	Restrictions or reduction in available groundwater	--	NA†	NA†	NA†	NA†	
AIR QUALITY								
Construction	21.	Violation of national and state ambient air quality standards due to construction emissions	--	X	25, 26, 27	Construction emission will be negligible	--	X
Operation	22.	As for (21) above due to booster station emissions standards due to construction emissions	--	X	25, 71	Negligible pollution from natural gas burning	--	X

Table S-1 (Cont.)

Resource Area		Impact Area	Significance of Potential Hazard or Impact S	NS	Mitigation Measure	Effectiveness	Residual Impact Significance S	NS
AIR QUALITY (Cont.)								
	23.	Influence on areas already in attainment and sensitive receptors	--	X	NN	NN	--	X
SOCIOECONOMICS AND TRANSPORTATION								
Construction	24.	Significant demand for temporary housing, for infrastructure	--	X	28, 33	Potential impacts 24 and 25 are not a feature of the project, mainly due to limited labor force	--	X
	25.	Water demand	--	X	NN	NN	--	X
	26.	Loss in tourist value	--	X	NN	NN	--	X
	27.	Loss in revenue for grazing BLM land	--	X	36	Loss will be minor, if any, and short-term; interference with grazing practices will be negligible	--	X
	28.	Unacceptable public risk	--	X	29	Risk associated with open trench and heavy equipment will be minimized	--	X
	29.	Traffic congestion, delays accidents, public inconvenience	--	X	28	Planned crossings of roads and maintenance of traffic flow	--	--
Operations	30.	Negative change in local tax base	--	NA†	NA†	Potential impacts 30, 31, 34, and 35 are not a feature of the project and, at most, insignificant	--	NA†

Table S-1 (Cont.)

Resource Area		Impact Area	Significance of Potential Hazard or Impact S	NS	Mitigation Measure	Effectiveness	Residual Impact Significance S	NS
SOCIOECONOMICS AND TRANSPORTATION (Cont.)								
	31.	Change in property values	--	NA†	NA†	Potential impacts 34 and 35 are negligible	--	NA†
	32.	Change in water demand	--	X	NN	Approximately same as present	--	X
	33.	Change in population	--	X	NN	Negligible increase, if any	--	X
	34.	Unacceptable public risk	--	X	NN	Risk is acceptable as indicated by existing pipelines	--	X
	35.	Loss in tourist value	--	NA†	NA†	NA†		NA†
NOISE								
<u>Construction</u>	36.	Construction equipment and activities exceed county guidelines	--	X	30, 31	People will experience exceedences (to about 60 dB(A)) only for a couple of days at specific points, only on work days during the day time, and not on weekends in recreation areas and elsewhere	--	X
<u>Operations</u>	37.	As above, due to noise of booster station; long-term inconsistency with State of California land use criteria	--	X	72	Noise will be attenuated and will be audible only at and near the site; no noise-sensitive locations will be affected	--	X
	38.	Will exceed 55 dB(A) over the long-term	--	X	72	Only within about 250 feet from the facilities	--	X

Table S-1 (Cont.)

Resource Area		Impact Area	Significance of Potential Hazard or Impact S	NS	Mitigation Measure	Effectiveness	Residual Impact Significance S	NS
LAND USE AND RECREATION								
Construction	39.	Inconsistent with adopted land use plans. Relative to future land uses in Contra Costs, conflict: Stoneman Park and Reservoir; Kirker Pass and central landfill proposals and proposed residential development; proposed highway improvements; and Coalinga Air Cargo Port and bike trails in Fresno County	X[3]		37	Further consultation with local planning authorities is required	X[3]	
	40.	Quality of recreation in Black Diamond Mines Regional Preserve (Contra Costa County) and Bethany Reservoir State Park	X	--	37	Planning the siting and timing of the construction will reduce the impacts and/or avoid them	--	X
	41.	Increase in recreational demand	--	X	33	Not only will the project have an insignificant impact on recreational demand, the labor force will not use public facilities except for recreation	--	X
	42.	Changes necessary in land use classification	X	--	32	After construction, most of the approximately 2,500 acres are returned to their original land use; existing utility corridors are used for about 80% of the route; no permanent conversion of prime agricultural land	--	X
	43.	Volumes of waste relative to landfill capacity	--	X	35	Waste volumes are small	--	X

Table S-1 (Cont.)

Resource Area	Impact Area	Significance of Potential Hazard or Impact S	NS	Mitigation Measure	Effectiveness	Residual Impact Significance S	NS
LAND USE AND RECREATION (Cont.)							
Operation	44. As for (42), two new booster stations and microwave towers will preempt existing land use on less than 40 acres	X	--	32	Prime agricultural land not affected	--	X
	45. New access to previously inaccessible areas	--	X	73, 74	Gates will be installed to interfere with motorized access to sensitive areas if any are identified as public lands	--	X
VISUAL RESOURCES							
Construction	46. Visual contrast of the right-of-way	--	X	8, 11, 15, 38, 40, 41	No strong visual contrast will develop	--	X
	47. Visual contrast of booster stations and microwave towers; conflicts with special policies for scenic highway and Westley Rest Stop Park	X	--	38, 39	The sites will be well sited environmentally in relation to travelers on 1-5 and existing structures	--	X
Operation	48. Visual contrast upon abandonment	--	X	75	Sites will be restored to their original condition	--	X
PALEONTOLOGY							
Construction	49. Loss or disturbance of significant paleontological resources	X	--	42, 43, 44, 45	With these mitigation measures, adverse impacts will be reduced to insignificance	--	X

Table S-1 (Cont.)

Resource Area	Impact Area	Significance of Potential Hazard or Impact: S	Significance of Potential Hazard or Impact: NS	Mitigation Measure	Effectiveness	Residual Impact Significance: S	Residual Impact Significance: NS
PALEONTOLOGY (Cont.)							
Operation	50. Sensitive resource areas becoming publicly known and accessible and unauthorized collection	--	X	73, 76	Unauthorized collection will be limited; area is presently accessible	--	X
CULTURAL RESOURCES							
Construction	51. The loss or disturbance of sites eligible for the NRHP	X	--	46, 47, 48, 49	With these mitigation measures, which include implementation of a cultural resources management plan, adverse impacts will be reduced to insignificance	--	X
	52. Conflicts with features of ethnographic importance and the cultural heritage of Native American groups	--	X	50, 51	Native American groups will be included in planning and mitigation measures to ensure minimal conflict	--	X
Operation	None identified						
TERRESTRIAL AND AQUATIC RESOURCES							
Construction	53. Impacts on species and communities, including raptors	X	--	52, 53, 54, 56, 57	Right-of-way habitats will be restored, raptor nesting sites will be avoided, and a range of other measures will ensure no significant impacts occur to aquatic and terrestrial plant and animal species	--	X

Table S-1 (Cont.)

Resource Area		Impact Area	Significance of Potential Hazard or Impact		Mitigation Measure	Effectiveness	Residual Impact Significance	
			S	NS			S	NS
TERRESTRIAL AND AQUATIC RESOURCES (Cont.)								
		Impacts on special statua species	X	--	52, 53, 55, 56, 57, 58, 59, 60, 61, 62	With these mitigation measures and others that may be required by the Biological Opinion, adverse impacts will be reduced to insignificance	--	X
	54.	Unauthorized collections	--	X	56	Potential impact is already possible due to general accessibility of the region; status quo will ba maintained	--	X
Operation	55.	Contamination by herbicides; weed control	--	X	77	Mechanical weed control and removal hava less impact	--	X
	56.	Spill impact on special status species habitat	X	--	78, 79	Measure ensures full-scale action; residual impact significance depends on many factors	X (2)	--
SYSTEM SAFETY AND RELIABILITY								
Operation	57.	Impacts due to system failures and/or failure to follow procedures	X	--	80, 81, 83	Measures enaure applicable design codes and regulations apply to project trained operators, access to information and communications, oil movement control and instantaneous shut-off, if necessary	X (2)	--

Table S-1 (Cont.)

Resource Area		Impact Area	Significance of Potential Hazard or Impact S	NS	Mitigation Measure	Effectiveness	Residual Impact Significance S	NS
SYSTEM SAFETY AND RELIABILITY (Cont.)								
	58.	Maintenance-related system failures	X	--	82	Maintenance checks will ensure safaty features are operational and the identification of hazards to the pipeline	$X^{(2)}$	--
	59.	Fires at booster stations	X	--	84, 85, 86, 87	When fires occur, they will be controlled	$X^{(2)}$	--
	60.	Pump spills at booster stations	--	X	88	Leak detection	--	X
OIL SPILL POTENTIAL								
Construction	61.	Spill impacts due to design or construction flaws	X	--	89, 91, 92, 93, 95, 101	Probability of a spill or leak is reduced	$X^{(2)}$	--
	62.	Spill impact due to geologic hazard or accidents	X	--	90	Probability is reduced by design	$X^{(2)}$	--
	63.	Spill impacts due to damage from pressure or leaks	X	--	93, 94, 97	Probability is reduced by systems design	$X^{(2)}$	--
	64.	Spill impacts due to lack of security	X	--	95, 98	Probability is reduced by inspection practices	$X^{(2)}$	--
	65.	Spill impacts due to lack of organization	X	--	99, 100	Size of spill is reduced by fast response; impact is mitigated by cleanup	$X^{(2)}$	--

NA+ = Not applicable to the project.
$X^{(2)}$ = Significance of residual impacts cannot be determined; it is a function of many factors including the size of the spill, time of year, sensitivity of the resources, response action,etc.
$X^{(3)}$ = Significance of future land use conflicts must be resolved through the local land use planning process.
NN = Not necessary.

1. INTRODUCTION

1.1 PROJECT BACKGROUND

The California State Lands Commission (SLC) and the Bureau of Land Management (BLM) of the U.S. Department of the Interior are preparing a combined environmental impact report/environmental impact statement (EIR/EIS) on the proposed San Joaquin Valley Pipeline. The San Joaquin Valley Pipe Line Company (SJVPLC), a wholly-owned subsidiary of Shell Pipe Line Corporation, proposes to build a heated underground pipeline in California to transport crude oil from oil fields in the southern San Joaquin Valley to Martinez in the San Francisco Bay Area. The project requires the preparation of an EIR under the California Environmental Quality Act (CEQA), and because the project also involves federal land, it requires the preparation of an EIS under the National Environmental Policy Act (NEPA). The project will require federal and state permits, including a "Grant of Right-of-Way" from BLM and a Land Use Lease from the SLC. A Joint Review Panel (JRP) consisting of BLM and the SLC was formed to direct the preparation of a single document, this EIR/EIS, to fulfill the requirements of both CEQA and NEPA. An application for the project was filed with BLM and SLC, which initiated the environmental review process.

The pipeline would transport about 120,000 barrels per day (120 MBD) of three types of crude oil to the existing Shell refinery facilities in Martinez. The new pipeline would tie into an existing pipeline originating in Bakersfield. The project includes an estimated 258 miles of new pipeline and all associated support facilities, such as booster stations, communication towers, and utility lines. Construction of the pipeline and its support facilities will begin in mid-1987, and the pipeline will be operational about a year later.

1.2 GENERAL PROJECT LOCATION

The proposed San Joaquin Valley Pipeline will extend from existing oil fields in Kern County in a northwest direction through central

California to Martinez in Contra Costa County. The route will follow the western edge of the San Joaquin Valley; the other counties it will pass through include Kings, Fresno, Merced, Stanislaus, San Joaquin, and Alameda. The regional setting of the proposed project is presented in Section 2, Project Description. Detailed maps of the proposed pipeline are presented in Appendix A.

1.3 AUTHORIZING ACTIONS

The project requires a variety of federal, state, and local permits. These permits, or authorizing actions, are listed in Table 1-1. Whereas this EIR/EIS is intended as an information and planning document for jurisdictional agencies and the public on the potential environmental impacts of the project, the permits will be action- or site-specific to ensure that the details of pipeline design, construction, and operation, which are mostly beyond the scope of this document, conform to safety and other requirements specified by federal, state, and local regulations. Since project construction cannot begin until project specifications conform to all permit requirements, the impact analysis in Chapter 4 assumes that all of these requirements will be met.

All responsible state and local agencies are expected to use this EIR/EIS as a basis for evaluating the permit applications for the project. California state and local agencies must decide on permits within 180 days of SLC's notice of completion (SLC being the lead agency under CEQA), or within 180 days after receipt of the completed permit applications, whichever is later.

Pursuant to the Mineral Leasing Act of 1920 (30 USC 185), and in accordance with 43 CFR 2880 (Oil and Gas Pipelines), the proposed project requires a Grant of Right-of-Way from the Bureau of Land Management (BLM) to construct, operate, or abandon facilities on federal lands under BLM's jurisdiction. Federal lands under BLM's jurisdiction are traversed near milepost 2.5 and 8 in Kern County and at milepost 70 in Kings County.

A Grant of Right-of-Way can only be obtained from BLM in compliance with the National Environmental Policy Act of 1969 (NEPA) and consistent with the environmental opinions of several federal cooperating agencies, including the U.S. Army Corps of Engineers (COE), Bureau of Reclamation, U.S. Fish and Wildlife Service (USFWS), and the U.S. Environmental Protection Agency (EPA).

BLM's decision to grant a right-of-way would require approval by Congress, since a portion of the pipeline (Segment 4) has a diameter of 24 inches for 173 miles.

The U.S. Department of Transportation (DOT) regulates the transportation of hazardous liquids (CFR 149, Part 195). CFR 49 includes many industrial standards (ANSI, ASTM, API, and others), as well as design requirements and construction, operation, and maintenance specifications which are commonly applied by the pipeline industry as good engineering practices.

Table 1-1

FEDERAL. STATE, AND COUNTY PERMITS AND APPROVALS
WHICH MAY BE NEEDED FOR PROJECT IMPLEMENTATION

Agency	Nature of Action	Project Feature
FEDERAL		
<u>Department of the Interior</u>		
Bureau of Land Management	Issues federal right-of-way grant	Pipeline, access road, power transmission lines, pump stations
	Issues temporary use permits	Temporary construction activities; staging areas
	Issues non-competitive mineral materials sales contract	Aggregate for booster station construction, access road construction
Bureau of Reclamation	Issues special land use license or easement	Pipeline and access roads crossing Delta Mendota Canal, Los Banos Reservoir per California DWR approval, and for Contra Costa Canal, per the Contra Costa Water Department
	Issues special land use permit	Pipeline, access roads, etc.
	Issues antiquities permits and permits to excavate or remove archaeological resources on public lands	All project features (federal lands only)
	Note: Bureau of Reclamation easement for crossing the Contra Costa canal is granted based on Contra Costa Water Department appruval	
Fish and Wildlife Service/ National Marine Fisheries Service	Issues Biological Opinions on threatened fish/marine mammals, and wildlife or plants as part of Section 7 of Endangered Species Act, for federal actions.	All project features
	Note: These two agencies perform complementary roles in implementing the Endangered Species Act.	

Table 1-1 (Cont.)

Agency	Nature of Action	Project Feature
Department of Defense		
Army Corps of Engineers	Issues nationwide and individual permit(s) (Section 404) for placement of dredged or fill material in waters of the U.S. or their adjacent wetlands	River or stream crossing for pipeline and access roads; pipeline construction
	Issues permit(s) (Section 10) for structures or work in or affecting navigable waters of the U.S.	Water diversion facilities, and construction resulting in alterations to streams
	Note: No navigable waters are crossed	
U.S. Navy	Issues easements to cross Department lands: individual base commanders have final aproval	Pipeline across Concord Naval Weapons Station
	Issues license for construction; Issues easement (license and easement issued from San Bruno, CA, facility)	
Federal Communications Commission	License to operate industrial radio service	Project communications
Department of Transportation		
Federal Highway Administration	Issues permit(s) to cross federal-aid highways	Pipeline, access roads
Environmental Protection Agency	Issues permit(s) to construct and operate surge tanks, storage tanks, transfer piping, and pumping equipment	Air emission permits and oil pollution control requirements for pump stations and tank storage facilities
	Issues NPDES permits(s) or wastewater discharges (CA and TX have primacy)	Any discharge of hydrostatic test water and discharges from tank storage facilities
	Reviews 404 permits	River or stream crossing
STATE		
California		
State Lands Commission	Issues leases to cross state land	Pipeline crossing on state lands
Department of Transportation	Issues permit(s) to cross state highways	Pipeline, access roads, transmission lines

Table 1-1 (Cont.)

Agency	Nature of Action	Project Feature
Department of Fish and Game	Issues stream alteration agreement	Possible alterations of stream course
	Issues Biological Opinion on state rare, threatened, and endangered species pursuant to BLM and California Dept. of Fish and Game Memorandum of Understanding, for BLM lands, and pursuant to California Endangered Species Act for lands not owned by BLM.	Pipeline, access roads
Water Resources Control Board	Issues permit to discharge hydrostatic test water	Pipeline
	Issues permit for wastewater discharge	Any discharges from pump stations, including
Air Pollution Control Districts	Issues permit for operating pump stations and storage tanks	Air emissions from oil heaters and storage tanks
State Historic Preservation Office	Issues cultural resource clearance	Pipeline, access roads; clearance required prior to construction
Department of Water Resources	Issues permits to cross California water projects	Pipeline crossings of irrigation canals and aqueducts
California Air Resources Board	Authorization to construct	Construction and operation of booster stations
California Fire Marshall Office	No permit to be issued	All project features
	Note: Monitors pipeline construction for adherence to all safety regulations	
COUNTY		
Kern		
Air Pollution Control District	Authority to construct Permit to operate	Construction and operations of booster stations
Planning Department	Cancellation permit for land conservation contracts	All project features within county
	Zoning	

Table 1-1 (Cont.)

Agency	Nature of Action	Project Feature
Kern (Cont.)		
	Conditional use permit	
	Building construction and grading permit	
	Electrical and plumbing permit Floor hazard evaluation	
Public Works Department	Encroachment permit	All roadways crossed within county
West Kern Water District	Permit to cross canal	All irrigation ditches within jurisdiction
Lost Hills Water District	Permit to cross canal	All irrigation ditches within jurisdiction
Belridge Water Storage District	Permit to cross canal	All irrigation ditches within jurisdiction
Kern Co. Board of Supervisors	Issue permit for crossing county roads Issue permit for removing Joshua trees	All roadways within county
Kings		
Air Pollution Control District	Authority to construct Permit to operate	Construction and operation of booster stations
Planning Department	Zoning permit Building permit Structural permit	All project features within county
Public Works Department	Encroachment permit Blasting permit	All roadways within county construction of pipeline
Westland Water District	Permit to cross canal Water apropriation permit	All irrigation ditches within jurisdiction
Fresno		
Air Pollution Control District	Authority to construct Permit to operate	Construction and operation of booster station SJV-2
Public Works and Development Services	Unclassified conditional use permit Zoning clearance Building permit	

Table 1-1 (Cont.)

Agency	Nature of Action	Project Feature
Fresno (Cont.)		
	Inspection permit for building, electrical and sewage Grading permit Encroachment permit Drainage permit	All project features within county (including roadways and irrigation ditches)
Pleasant Valley Water District	Permit to cross canal	All irrigation ditches within jurisdiction
Westland Water District	Permit to cross canal Water appropriation permit	All irrigation ditches within jurisdiction
Central California Irrigation District	Permit to cross canal	All irrigation ditches within jurisdiction
Merced		
Planning Department	Land leveling/grading permit Building permit Conditional use permit Blasting permit	All project features within county
Public Works Department	Encroachment permit	All roadways crossed in county
Quinto Water District	Permit to cross canal Water appropriation permit	All irrigation ditches within jurisdiction
Romero Water District	Permit to cross canal	All irrigation ditches within jurisdiction
San Luis Water District	Permit to cross canal Water appropriation permit	All irrigation ditches within jurisdiction
Santa Nella County Water District	Permit to cross canal	All irrigation ditches within jurisdiction
Centinella Water District	Permit to cross canal	All irrigation ditches within jurisdiction
Landsdale Water District	Permit to cross canal	All irrigation ditches within jurisdiction
Mustang Water District	Permit to cross canal	All irrigation ditches within jurisdiction
Central Cal. Irrigation District	Permit to cross canal	All irrigation ditches within jurisdiction

Table 1-1 (Cont.)

Agency	Nature of Action	Project Feature
Stanislaus		
Planning Commission	Use permit Zoning permit	All project features within county
Public Works Department	Building permit Grading permit Encroachment permit	Pipeline construction Roadways crossed in county
Fire Warden Department	Blasting permit	Pipeline construction
County Council	Franchise agreement	All project features within county
San Joaquin		
Air Pollution Control District	Authority to construct Permit to operate	Construction and operation of booster station SJV-4
Planning Department	Conditional use permit Building permit Subdivision permit	Operation of booster station SJV-4
Public Works Department	Encroachment or franchise permits Flood hazard evalation	Roadways crossed in county Streams crossed in county
Sheriff's Department	Blasting permit	Pipeline construction
Hospital Water District	Permit to cross canal	All irrigation ditches within jurisdiction
Plain View Water District	Permit to cross canal Water appropriation permit	All irrigation ditches within jurisdiction
Alameda		
Planning Department	Conditional use permit Grading permit Amendment to land conservation contract Approval of conformance with general county plan Subdivision permit	Construction and operation of pipeline; all project features

Table 1-1 (Cont.)

Agency	Natore of Action	Project Featore
Alameda (Cont.)		
Public Works Department	Encroachment permit Flood control permit Seismic and geologic evaluations	All irrigation ditches within coonty
Fire Patrol Department	Blasting permit	Pipeline constroction
Contra Costa		
Planning Department	Stroctoral permits	Operation of Martinez meter station
Building and Grading Department	Electrical and plumbing permits Grading permit Building permit	Operation of Martinez meter station
Poblic Works Department	Drainage permit Stream crossing permit	All irrigation ditches within coonty
	Coonty road crossing permit	Roadways crossed in coonty
Flood Control Department	Flood control permit Encroachment permit	All irrigation ditches within coonty
County Board of Supervisors	Blasting permit	Constroction of pipeline

Source: Woodward-Clyde, 1985; Ecology and Environment, Inc., 1986.

California state regulatory requirements parallel those of the federal government. Construction, operation, and abandonment of the facilities on state lands require a Land Use Lease from the California SLC under the California Public Resources Code. SLC, in order to grant right-of-way, is required to comply with the California Environmental Quality Act (CEQA). Under CEQA, other state agencies are involved in the approval process with which the additional permitting requirements are coordinated.

1.4 ENVIRONMENTAL REVIEW PROCESS

The actual environmental review of the proposed action and its alternatives was initiated once all lead agency project application procedures were completed. The BLM started the federal EIS process by publication of a Notice of Intent to prepare an EIS in the Federal Register of January 17, 1986. In California, the EIR process began with the publication of a Notice of Preparation, which the SLC circulated to all state and local agencies and jurisdictions along the proposed pipeline route. The Notice of Preparation contained a brief project description and a set of maps, and requested the involved agencies to submit their comments, questions, or concerns about the proposed action. The JRP used these agency responses, as well as input from public hearings held along the pipeline route, to identify the issues which are addressed in this EIR/EIS.

The next step in the environmental review process is the publication of a Draft EIR/EIS on the proposed action and its alternatives. The present document has been prepared to fulfill this requirement. It is called a "draft" because it is subject to revision based on input received during the public comment period, which ends 60 days after the Draft EIR/EIS publication date. Under NEPA and CEQA, any individual or agency may comment on the contents of this document during the public review period. The comments may be presented either by testimony at scheduled public hearings, or by letter.

Sixty days after Draft EIR/EIS publication, the lead agencies will collect and organize all comments received on the document, and use these as the basis for preparing the Final EIR/EIS. Responses will be made to all comments. Depending on the nature and extent of the individual comments, the text of the Draft EIR/EIS may be revised, and individual written responses will be prepared, or the Final EIR/EIS may be presented in an abbreviated format which includes a summary of the proposed action and its alternatives, identification of the preferred alternative, and a summary of and responses to comments received on the Draft EIS. Once the Final EIR/EIS is published, the lead agencies will consider the document for certification as adequate and complete. Assuming Final EIR/EIS certification, the lead agencies will then consider the project itself for approval.

1.5 PURPOSE OF AND NEED FOR THE PROJECT

The San Joaquin Valley Pipeline project is proposed as a means of assuring a reliable supply of crude oil for delivery at a competitive price from Kern County oil fields to Shell's refinery in Martinez.

Under an exchange agreement with Texaco, Shell currently transports 120 MBD of oil through Texaco's heated pipeline, which extends from the Caliola tank farm in Fresno County to refineries in Contra Costa County. This exchange agreement expires in 1988, after which the Texaco pipeline will be available to Texaco and independent producers and refiners having protected rights to use the pipeline under the Texaco/Federal Trade Commission Consent Decree (related to Texaco's acquisition of the Getty Oil Company). Once this decree becomes effective, it could reduce the transmission capacity available to Shell in the Texaco pipeline. In addition, Texaco's own transportation requirements could reduce or preempt the pipeline capacity available to Shell.

Economic factors also support a proposal to build a pipeline to the Martinez refinery. The Texaco pipeline, with a 20-inch diameter, is currently transporting over 200 MBD, including Shell's component of about 120 MBD. This 200-MBD total volume is at or near the pipeline's capacity, and because this flow rate exceeds optimum operating costs on a per-barrel basis, it is not cost-effective for Shell to continue to transport oil through the Texaco pipeline, even if Shell could obtain a long-term guarantee for its 120-MBD share of the total capacity. Additionally, because the Texaco line is privately owned and operated, Shell must pay for the right to use this pipeline, a cost it would avoid by constructing its own pipeline. The costs of building the San Joaquin Valley Pipeline are currently estimated at $110 million, and it is uncertain if cost savings alone are sufficient to justify the project. However, the project's main objectives are reliable and cost-competitive oil transportation, and these would be achieved by building a new pipeline.

As a common carrier, the San Joaquin Valley Pipeline must be made available to any transporter meeting tariff requirements specified by the Federal Energy Regulatory Commission (FERC). Although no studies have been made of other sources of oil that might be available for shipment using the proposed pipeline and their destinations, the routing of the proposed pipeline makes it reasonably accessible to San Joaquin Valley crude production areas.

1.6 AGENCY PREFERRED ALTERNATIVE

Federal regulations developed by the Council on Environmental Quality (CEQ) require federal agencies to identify their preferred alternative if one exists [40 CFR 1502.14 (e)], although the California Environmental Quality Act does not have a similar requirement. In keeping with the CEQ requirements, the BLM has developed the agency's preferred alternative. However, the preferred alternative stated below is not a final agency decision; rather, it is an indication of the federal agency's preliminary preference. The preference identified below is that of the BLM, the federal lead agency.

Construction of the proposed San Joaquin Valley pipeline as described in this document, including all specified mitigation measures, is the BLM's preferred alternative.

1.7 ORGANIZATION OF THE EIR/EIS

The following sections cover the material in the necessary depth for environmental management and information purposes:

2. PROJECT DESCRIPTION

This section describes the proposed action; discusses standard and special construction, operation, and maintenance procedures; and presents the various alternatives to the proposed project, including the no-action alternative.

2.1 PROPOSED PROJECT

The San Joaquin Valley Pipe Line Company (SJVPLC) proposes to construct a heated, buried pipeline system to transport 120 MBD of crude oil from existing oil production fields in the southern San Joaquin Valley to the existing Shell Oil Company Martinez refinery near Suisun Bay in Contra Costa County. The sources of the oil are the South Belridge, Midway-Sunset, Coalinga, Kern River, and Mount Poso oil fields in Kern and Fresno counties. Planned deliveries are shown in Table 2-1.

The proposed project entails the construction of 257.6 miles of new pipeline in four segments, construction of two new booster stations, and modification of three existing booster stations and two existing injection stations. Booster stations pump and heat the crude oil to ensure a continuous flow through the pipeline at design capacities. Injection stations add new oil to the pipeline.

The project will be operated as a public utility subject to the applicable provisions of the California Public Utilities Code and, therefore, as a common carrier, it will be available to any shipper who meets tariff requirements. However, the primary shipper is anticipated to be the Shell Oil Company, an affiliate of the SJVPLC.

Shell is currently transporting about 120 MBD of crude oil from the San Joaquin Valley fields to its Martinez refinery via exchange agreements with other companies that operate pipelines. Shell's primary exchange agreement is through the privately owned Texaco heated-oil pipeline extending directly to the San Francisco Bay Area. The agreement for Shell to transport via the Texaco pipeline expires in

Table 2-1

PLANNED DELIVERIES

Field	Typical Deliveries (MBD)*	Maximum Deliveries (MBD)
South Belridge	40	80
Midway-Sunset	30	30
Coalinga	10	20
Kern River	25	45
Mount Poso	15	25
TOTAL	120	**

*MBD = Thousand barrels per day.
**Maximum delivery estimates for each field are not additive and cannot exceed pipeline capacity.

Source: San Joaquin Valley Pipe Line Company.

the beginning of the third quarter of 1988. The Texaco pipeline, the only existing heated-oil pipeline extending north to the San Francisco Bay Area, is operating at or near maximum capacity and does not provide an adequate degree of flexibility and assurance for Shell's long-term transportation requirements.

The present project is proposed to ensure that Shell can continue to transport 120 MBD of crude oil to Martinez. Other transportation methods would be less efficient, less reliable, and more costly than the proposed project. These alternative transportation methods include a combination of rail, marine, and truck transportation, and crude oil exchanges involving other pipeline companies.

No pipelines are anticipated to be abandoned as a result of the construction and operation of this project. In addition, the production and capacity of the existing Martinez refinery would not be affected by the proposed project, because the refinery is already operating at or near capacity and because the proposed project would deliver no more oil to the refinery than is currently being delivered (i.e., 120 MBD). The Final EIR for the Martinez refinery (Shell Oil Company Martinez Manufacturing Complex Modernization, November 1979, State Clearinghouse No. SCH79101608) contains detailed information about the refinery and its capacity.

2.1.1 Description of the Proposed System and Project Components

The project consists of existing and proposed facilities, including the pipeline and associated valves and meter station, booster/heater and injection stations, communication sites, and other ancillary facilities. These facilities include equipment storage sites; a new 80,000-barrel (80-MBBL) storage tank to be constructed at the existing Mid booster station in Kern County; access roads; and energy and water supplies for all new stations and communication sites. Figure 2-1 shows the proposed pipeline and associated facilities. Table 2-2 summarizes the pipeline components. Detailed maps of the pipeline system are contained in Appendix A.

Nearly 97% of the proposed pipeline right-of-way and the total construction and operation acreage for all project facilities is on privately owned land. Table 2-3 lists ownership category and areas of land that will be affected by the proposed action.

2.1.1.1 Pipeline System

The project is divided into four segments, each having a different pipeline size (see Table 2-2). The size of the pipe in each segment is determined by expected oil throughputs and the optimum pressures required for efficient movement of oil through that segment. The 257.6-mile pipeline originates near Fellows in Kern County and extends northwesterly for a total of 258.3 miles to its terminus at the Martinez refinery (see Figure 2-1). The discrepancy between the length of the pipeline and the total length of the system is due to land requirements for the booster/injection station facilities. Each of the proposed pipeline segments is described below.

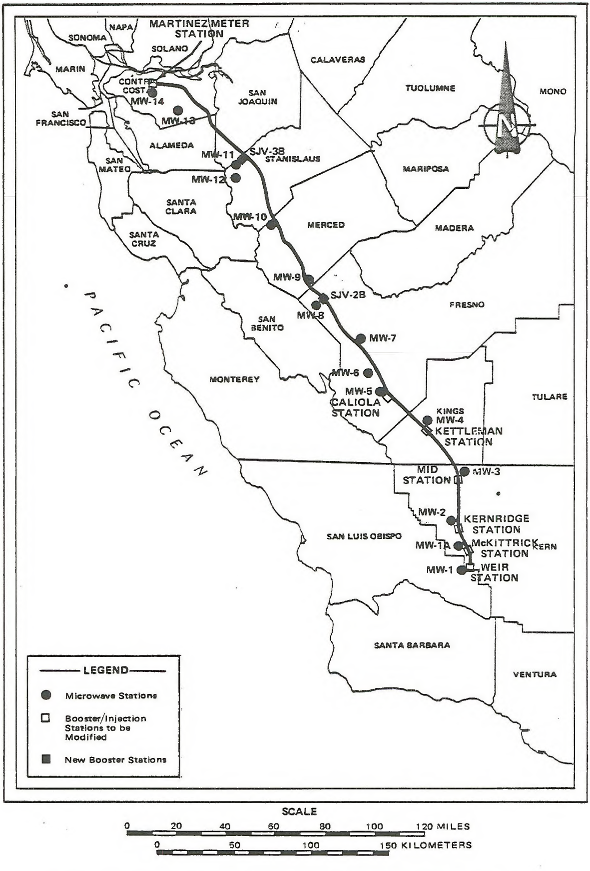


Figure 2–1 PROPOSED PIPELINE SYSTEM AND PROJECT COMPONENTS (SEE DETAILED PROJECT MAPS IN APPENDIX A)

Table 2-2

SUMMARY OF PIPELINE FACILITIES

Pipeline Segment	Length (miles)	Diameter (inches)	Status	Injection/Booster Stations	Station Status	Proposed Microwave Towers*
1	18.5	10.75	Proposed	Weir (I) McKittrick (I)	Existing Modify	Weir (MW-1) McKittrick (MW-1A)
2	21.6	18	Proposed	Kernridge (I)	Modify	Kernridge (MW-2)
3	44.4	14	Proposed (loop)	Mid Station (B)**	Modify	Mid Station (MW-3)
		14	Existing	Kettleman (B)	Existing	Kettleman (MW-4)
4	173.1	24	Proposed	Caliola (B)	Modify	Caliola Pump Station (MW-5)
				SJV-2b (B)	Proposed	Skunk Hollow (MW-6) Panoche Junction (MW-7)
				SJV-3b (B)	Proposed	SJV-2(b) Booster Station (MW-8) Laguna Seca Ranch (MW-9) Cottonwood Hill (MW-10) SJV-3(b) Booster Station (MW-11) Mount Oso (MW-12) Mount Diablo (MW-13) Martinez Refinery (MW-14)

Key: I= Injection, B = Booster

*Location and height of these towers are listed in Table 2-8.
**Includes construction of one 80,000-BBL storage tank at the station.

Table 2-3

OWNERSHIP OF LAND AFFECTED BY THE PROPOSED PROJECT

Owner	Right-of-Way Length (miles)	80-foot Construction Right-of-Way (acres)	30-foot Operation Right-of-Way (acres)
BLM	2.3	22.3	8.4
Bureau of Reclamation	3.5	33.8	12.7
U.S. Navy	1.1	10.6	4.0
State	1.0	9.5	3.6
County	1.0	9.5	3.6
Total Public	8.9	85.7	32.3
Total Private	249.4	2,418.4	906.9
TOTAL	258.3*	2,504.1	939.2

*The minor discrepancy of 0.6 miles between the estimated length of the right-of-way and the length of the pipeline (257.6 miles) is due to additional land included in booster station houses.

Mileposts used in this EIR/EIS are arranged such that the southernmost point of the pipeline is set to 0 (zero) and the northern terminus is set to 258.3. Mileposts, therefore, are continuous and increase from south to north. Since the mileposts differ from those used in the application submitted to the SLC, Table 2-4 is included for cross-reference. This table also identifies the USGS topographical maps which show the route at a scale of 1:24,000.

Segment 1 - Weir Injection Station to Kernridge Station

The first section, which consists of approximately 18.5 miles of 10.75-inch diameter pipeline, will be constructed in Kern County from the existing Weir injection station in the Midway-Sunset oil field through an existing Shell central storage facility in the Belridge production field, to the existing Kernridge injection station. The McKittrick injection station, located about halfway between Weir and Kernridge, will be modified as part of the project. The existing Weir station will not be modified.

This section of the pipeline system will transport 30 MBD from the Midway-Sunset field through the Belridge storage facility into Segment 2 of the pipeline, with a contribution of 15 MBD from the Weir station and 15 MBD from the McKittrick injection station. The Weir station has a 30-MBBL tank from which oil will be pumped through meters into the 10.75-inch pipeline. Since these facilities presently pump this oil into the Texaco pipeline system, no modifications are required. The McKittrick injection station will inject Midway-Sunset oil from existing Union Oil Company tankage into the 10.75-inch pipeline. Meters and positive displacement pumping units will be added to the station.

Segment 2 - Kernridge Station to Mid Station

Segment 2 consists of 21.6 miles of 18-inch-diameter pipeline from the Kernridge station to Mid station, where it will feed into an existing 14-inch-diameter Shell Oil Company crude oil pipeline and a proposed 14-inch line constructed parallel to the existing line (Segment 3). This configuration is referred to in the industry as a looped pipeline. Beginning at Kernridge, oil will pass directly into this segment of the 18-inch pipeline without being stored. The existing Kernridge injection station, now delivering 40 MBD from the Belridge field, will be upgraded to deliver the additional 30 MBD from the Segment 1 10.75-inch pipe. Thus, this segment will transport a total of 70 MBD of oil.

Segment 3 - Mid Station to Caliola Booster Station

From Mid station to the Caliola booster station, approximately 44.4 miles of 14-inch-diameter pipeline will be constructed parallel to an existing 14-inch-diameter Shell pipeline originating near Bakersfield and terminating at the existing Shell Caliola tank farm and booster station in Fresno County. This looped pipeline will use and tie-in both the new and the existing 14-inch pipelines. The existing Kettleman booster station, located at the midpoint of Segment 3 (approximately milepost 62), will not require any modifications.

Table 2-4

EIR/EIS MILEPOSTS FOR THE
PROPOSED PROJECT IDENTIFIED BY
USGS QUADRANGLE, COUNTY, PIPELINE SEGMENT, AND
MILEPOSTS USED IN ORIGINAL APPLICATION (FROM SOUTH TO NORTH)

USGS Quadrangle	Quad Map. No.	County	Pipeline Segment	SJVPLC Milepost	EIR/EIS Milepost
Fellows	1	Kern	1	0.0 - 2.7	0.0 - 2.7
Western Hills	2	Kern	1	2.7 - 5.23	2.7 - 5.2
Reward	3	Kern	1	5.23 - 12.9	5.2 - 12.8
Belridge	4	Kern	1 & 2	12.9 - 23.2	12.8 - 22.9
Lost Hills	5	Kern	2	23.2 - 31.65	22.9 - 31.5
Lost Hills, NW	6	Kern	2 & 3	31.65 - 0.76	31.5 - 40.9
Lone Tree Well	7	Kern	3	0.76 - 1.57	40.9 - 41.7
West Camp	8	Kern/Kings	3	1.57 - 11.3	41.7 - 51.4
Dudley Ridge	9	Kings	3	11.3 - 13.51	51.4 - 53.7
Los Viejos	10	Kings	3	13.51 - 22.4	53.7 - 62.6
Kettleman City	11	Kings	3	22.4 - 24.8	62.6 - 64.6
La Cima	12	Kings	3	24.8 - 33.87	64.6 - 73.8
Avenal	13	Kings/Fresno	3	33.87 - 35.9	73.8 - 75.7
Guijarral	14	Fresno	3 to 4	35.9 - 40.64	75.7 - 84.9
Coalinga	15	Fresno	4	40.64 - 42.68	84.9 - 87.0
Domengine Ranch	16	Fresno	4	42.68 - 53.55	87.0 - 97.7
Tres Picoa Harms	17	Fresno	4	53.55 - 54.55	97.7 - 98.7
Lillis Ranch	18	Fresno	4	54.55 - 63.6	98.7 - 107.8
Levis	19	Freano	4	63.6 - 67.35	107.8 - 111.4
Monocline Ridge	20	Fresno	4	67.35 - 76.0	111.4 - 120.0
Tumey Hills	21	Fresno	4	76.0 - 77.6	120.0 - 121.5
Chounet Ranch	22	Fresno	4	77.6 - 87.3	121.5 - 131.2
Hammonds Ranch	23	Fresno	4	87.3 - 89.15	131.2 - 133.1
Laguna Seca Ranch	24	Fresno/Merced	4	89.15 - 99.3	133.1 - 143.2
Ortigalita	25	Merced	4	99.3 - 99.9	143.2 - 143.9
Ortigalita Peak, NW	26	Merced	4	99.9 - 109.55	143.9 - 153.6
Volta	27	Merced	4	109.55 - 116.37	153.6 - 160.2
San Luis Dam	28	Merced	4	116.37 - 121.8	160.2 - 166.0
Howard Ranch	29	Merced/Stanislaus	4	121.8 - 131.07	166.0 - 175.4
Newman	30	Stanialaus	4	131.07 - 132.37	175.4 - 176.8
Orestimba Peak	31	Stanislaus	4	132.37 - 140.25	176.8 - 184.5
Patterson	32	Stanislaus	4	140.25 - 149.3	184.5 - 193.7
Westley	33	Stanislaua	4	149.3 - 151.5	193.7 - 195.9
Solyo	34	Stanislaua/San Joaquin	4	151.5 - 161.3	195.9 - 204.6

Table 2-4 (Cont.)

USGS Quadrangle	Quad Map. No.	County	Pipeline Segment	SJVPLC Milepost	EIR/EIS Milepost
Lone Tree Creek	35	San Joaquin	4	161.3 - 161.76	204.6 - 205.0
Tracy	36	San Joaquin	4	161.76 - 169.97	205.0 - 213.5
Midway	37	San Joaquin/Alameda	4	169.97 - 175.75	213.5 - 219.4
Clifton Court Forebay	38	Alameda	4	175.75 - 179.1	219.4 - 222.7
Byron Hot Springs	39	Alameda/Contra Costa	4	179.1 - 186.77	222.7 - 230.6
Brentwood	40	Contra Costa	4	186.77 - 191.04	230.6 - 235.6
Antioch South	41	Contra Costa	4	191.04 - 199.67	235.6 - 244.6
Clayton	42	Contra Costa	4	199.67 - 202.4	244.6 - 247.3
Honner Bay	43	Contra Costa	4	202.4 - 207.3	247.3 - 252.3
Vine Hill	44	Contra Costa	4	207.3 - 213.7	252.3 - 258.3

This section of looped pipeline will transport a total of 110 MBD, including the 70 MBD from the proposed 18-inch Kernridge-Mid station line and the 40 MBD currently being transported by the existing 14-inch Bakersfield to Caliola line. The oil streams from each of these pipelines will be combined at the Mid booster station and carried to the Caliola station through both the existing 14-inch line and the proposed 14-inch line.

Approximately once a week, for a period of 1.5 days, lube crude, a unique type of crude oil from the Poso field, will be sent through the Bakersfield line and allowed to accumulate in the new 80-MBBL storage tank at Mid station. During this time, the normal flow of heavy crude from Bakersfield will be shut off to allow transport of this lube crude, and heavy crude from Segment 2 will be pumped to Martinez at this segment's full design capacity of 110 MBD (rather than the normal 70 MBD). When the 80-MBBL storage tank is full of lube crude, the flow from Segment 2 will be shut down, and this special crude will be pumped out of the tank and transported to Martinez.

Both the Mid and Kettleman booster stations are existing stations. Mid station will be modified to accommodate the increased throughputs; it will require an additional gas turbine-driven pumping unit, a 5 million (5 MM) BTU/hr direct-fired heater, and the new 80-MBBL storage tank.

Segment 4 - Caliola Booster Station to Martinez Refinery

For the remaining 173.1 miles, a 24-inch-diameter pipeline will be constructed from the Caliola tank farm and booster station through Fresno, Merced, Stanislaus, San Joaquin, Alameda, and Contra Costa counties, to the existing Shell Martinez refinery (see Figure 2-1). For most of its length, this section of pipeline has been routed adjacent to an existing Pacific Gas and Electric transmission line right-of-way and a Texaco pipeline right-of-way.

Segment 4 will transport 120 MBD, including 110 MBD from the looped segment and 10 MBD from local Coalinga production. (During the time that lube crude is being transported through Segment 4, the 10 MBD of local Coalinga production will be stored in tankage at Caliola.) The Caliola booster station and proposed SJV-2(b) and SJV-3(b) booster stations will pump and heat the oil along this length, and the oil will pass through the Martinez meter station and into existing tankage at the Martinez refinery. The proposed SJV-2(b) and SJV-3(b) booster stations will be located at mileposts 132.9 and 201.0, respectively. The Caliola station will be modified to pump the increased throughputs. These modifications will consist of a new gas turbine-driven pumping unit and a new gas-fired heater.

2.1.1.2 Project Components

As previously described, pipeline diameter will vary along the proposed 258-mile route based on throughput volumes and operating pressures. Specifications for the pipeline and related facilities will meet U.S. Department of Transportation (DOT) regulations (49 CFR 195, ANSI B-31.4) and the California Pipeline Safety Act (California Government Code, Chapter 1222, Sections 51010-51018). A cathodic corrosion protection system will be designed, installed, and operated to DOT specification. No insulation will be used on any portion of the pipeline. A summary of pipeline design specifications is provided in Table 2-5.

The proposed pipeline system will include a meter station near the Martinez refinery and 17 block (shutoff) valve stations: six at existing or proposed booster/injection stations; one near the Martinez meter station; seven at aqueduct, canal, or river crossings; and the other three at intermediate points along the pipeline. These block valves will be no more than 30 miles apart.

The total land requirements for the project are summarized in Table 2-6 and described below for booster stations and ancillary facilities.

Booster/Injection Stations

The project includes five booster or pump stations and three injection stations. Only two new booster stations (SJV-2b and SJV-3b) need to be built as part of the proposed project; the others are existing stations, some of which require modifications. Table 2-7 gives information on the locations, status (existing, modified, or new), designed horsepower, and heater requirements for these stations. A typical layout of a booster station is shown in Figure 2-2 (see also the visual simulation in Section 4.2.10). New gas turbine-powered and existing electric motor-driven pumps will be used to boost the pressure in the pipeline. Waste heat from the gas turbine pumps proposed for four of the five booster stations will be used to heat crude oil in the pipeline. Natural-gas-fired heaters will supplement this waste heat in reducing oil viscosity and facilitating flow.

The land requirements for two new booster stations total about 12 acres for construction and 6 acres during operations.

Communication Sites

The project includes 15 communication sites, consisting of microwave tower repeater stations with associated electronic equipment. These sites have been numbered from 1 and 1A to 14 in Figure 2-1. The facilities are designed to relay pipeline data by microwave communications between the booster/injection stations and along the pipeline to Shell's control center in Anaheim. A typical microwave repeater station is illustrated in Figure 2-3. Two sites require modifications, while the other sites require a full complement of microwave communication facilities including microwave repeater towers (see Table 2-8).

The existing microwave communication facilities at Weir and Kernridge stations will be modified for use by the project. At the Weir station, the existing microwave station at the Shell Weir Production Office will be modified by addition of multiplex channels (indoor electronic equipment). No other changes will be necessary.

Table 2-5

DESIGN SPECIFICATIONS FOR EACH PIPELINE SEGMENT

Characteristic	Segment 1 (18.5 miles)	Segment 2 (21.6 miles)	Segment 3 (looped) (44.4 miles)	Segment 4 (173.1 miles)
Pipe Line Dimensions	10.75-inch outside diameter X 0.188-inch wall thickness	18-inch outside diameter X 0.188-inch wall thickness	14-inch outside diameter X 0.188-inch wall thickness	24-inch outside diameter X 0.188-inch wall thickness
Maximum Operating Pressure	1637 psig*	978 psig	1,257 psig	789 psig
Maximum Operating Temperature	200°F	200°F	200°F	200°F
Maximum Nominal Design Flow Rate	30 MBD**	110 MBD	150 MBD†	160 MBD
Proposed Delivery Volumes	30 MBD	70 MBD	110 MBD	120 MBD

*Pounds per square inch gauge.
**Thousand barrels per day.
†Includes 75 MBD in new looped 14-inch-diameter pipeline and 75 MBD in existing 14-inch-diameter pipeline.

Source: San Joaquin Valley Pipe Line Company.

Table 2-6

TOTAL ADDITIONAL LAND REQUIREMENTS FOR CONSTRUCTION AND OPERATION OF THE PROJECT*

Facility	Land Requirements (acres) Construction	Operation
Right-of-way for pipeline	2,503.2**	938.8
Construction staging areas	60.0	0
Rights-of-way for ancillary facilities:		
SJV-2b, MW #8	38.4	19.2
SJV-3b, MW #11	26.6	13.3
MW #6, 7, 9, 10, 12, 13	19.0	9.7
Total rights-of-way	2,647.2	981.0
Land for ancillary facilities:		
SJV-2b	6.0	3.0
SJV-3b	6.0	3.0
MW #6, 7, 9, 10, 12, 13	0.6***	0.3
MW #1A, 3, 4, 5	0.4***	0.2
Total land for ancillary facilities	13.0	6.5
Total land requirements	2,660.2	987.5

MW=Microwave station

*Other land requirements are met by existing facilities.
**Not including temporary work spaces of about 0.5 acre each at highway and waterway crossings.
***Estimated acreage twice as large as during operation.

Table 2-7

BOOSTER/INJECTION STATION LOCATIONS, STATUS,
AND DESIGNED ENERGY REQUIREMENTS FOR THE PROPOSED PROJECT

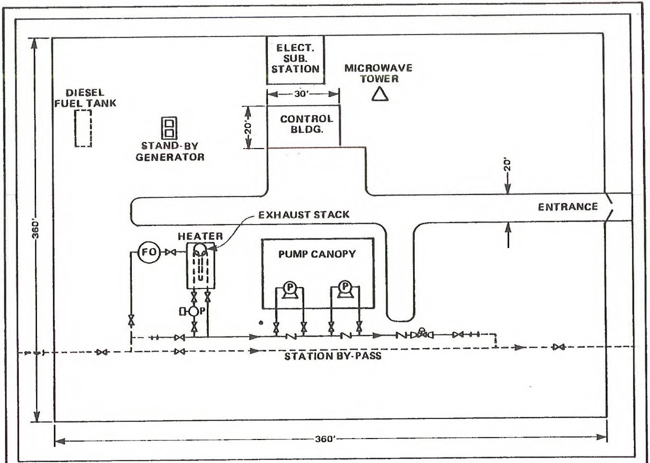
Station (Segment)	Location (County)	Status	Existing Horsepower Ratings	New or Additional Horsepower Requirements	Existing Heating Capacity (Btu/hr)	New or Additional Heating Requirements (Btu/hr)
Weir (1)	Kern	As existing	None	No additional horsepower	0	No additional heaters
McKittrick Injection (1)	Kern	Modified	None	600 (additional)*	0	No additional heaters
Kernridge Injection (2)	Kern	Modified	2,400	No additional horsepower	0	No additional heaters
Mid Station (3)	Kern	Modified	2,000	2,500 (additional)**	15 MM	5 MM†
Kettleman (3)	Kings	As existing	2,000	No additional horsepower	--	No additional heaters
Caliola (3)	Fresno	Modified	2,000	1,800 (additional)**	48 MM	15 MM†
SJV-2b (4)	Fresno	New	--	1,800**	--	15 MM†
SJV-3b (4)	Stanislaus	New	--	1,800**	--	15 MM†

*Electric motor
**Gas turbine
†Gas-fired

Note: All booster/injection stations occupy or will occupy about 3 acres (360 feet x 360 feet).

Source: San Joaquin Valley Pipe Line Company.

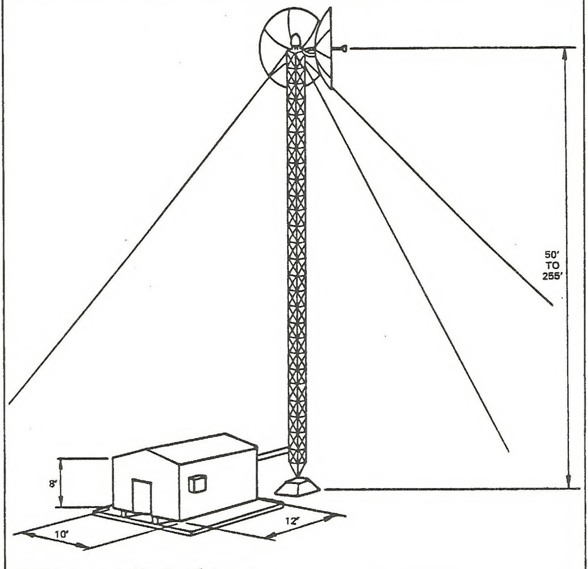
MM = million
BTU = British Thermal Units



SOURCE: Woodward-Clyde Consultants

NOT TO SCALE

Figure 2–2 LAYOUT OF TYPICAL BOOSTER STATION



SOURCE: San Joaquin Valley Pipe Line Company.

NOT TO SCALE

Figure 2–3 TYPICAL MICROWAVE TOWER REPEATER STATION

Table 2-8

PROPOSED LOCATIONS OF MICROWAVE TOWER REPEATER STATIONS

Site Number	Station (Segment)	Location: County	Township	Range	Section	Height (feet)
1	Weir (1)	Kern	T31S	R22E	22	100
1A	McKittrick (1)	Kern	T30S	R22E	18	100
2	Kernridge (2)	Kern	T28S	R21E	32	205
3	Mid (3)	Kern	T25S	R21E	20	205
4	Kettleman (3)	Kings	T22S	R18E	24	255
5	Caliola Pump Station (3)	Fresno	T20S	R16E	4	180
6	Skunk Hollow (4)	Fresno	T18S	R15E	36	180
7	Panoche Junction (4)	Fresno	T16S	R14E	7	205
8	SJV-2b Booster Station (4)	Fresno	T13S	R11E	35	205
9	Laguna Seca Ranch (4)	Merced	T12S	R10E	25	130
10	Cottonwood Hill (4)	Merced	T9S	R8E	4	105
11	SJV-3b Booster Station (4)	Stanislaus	T4S	R6E	21	50
12	Mount Oso (4)	Stanislaus	T5S	R5E	12	50
13	Mount Diablo (4)	Contra Costa	T1N	R1W	36	50
14	Martinez Refinery (4)	Contra Costa	T3N	R2W	--	80

Note: Microwave communication towers exist at Weir and Kernridge. Their heights will remain the same, but indoor electronic equipment will be added. All other microwave towers will be constructed including the SJV-2(b) and SJV-3(b) towers, which will be built within the booster station acreage. The remaining towers will require plots measuring 50 feet x 50 feet.

Source: San Joaquin Valley Pipe Line Company.

Microwave facilities exist at the Kernridge production facilities, but not at the injection station site. A fiber-optic cable local area network is currently being installed as part of the Kernridge production fields, though not as part of the proposed project. However, the local area network will provide an interconnection between the existing microwave station and the injection station, so that the existing station can be used as part of the communication system for the proposed project. The only modification required will be the addition of multiplex channels to the existing station.

No microwave facilities are currently present at Mid, Caliola, McKittrick, or Kettleman, and microwave stations will be required to be built at each of these sites, at the two new booster station sites (SJV-2b and SJV-3b), and at the Martinez metering station. The other six will be located at sites along Segment 4 not presently associated with existing Shell facilities. Some are sited less than 1 mile to over 3 miles from the pipeline. Exact locations will depend on topographical prominence and ease of access. Each tower will occupy approximately 2,500 square feet of fenced area (50 feet x 50 feet) with varying additional right-of-way area required for access and electrical lines to those sites not located at existing stations.

Ancillary Facilities

Ancillary facilities required for operation of the pipeline system may generally be categorized as follows:

- Three temporary work space areas (staging areas) to assemble and store equipment and materials for all phases of project construction.

- Access roads from existing roads to the new booster stations and to microwave repeater station No. 10 (Cottonwood Hill).

- Water lines (2-inch-diameter) for water to promote efficient fuel combustion, natural gas supply lines from existing mains to booster/injection stations, and electrical transmission lines from existing power lines to booster/injection stations and microwave sites.

- The addition of an 80-MBBL insulated storage tank to be constructed in accordance with design code API 650 (governing welded storage tanks) at the Mid booster station.

- A total of five 500-gallon diesel tanks, one each at Mid, Caliola, SJV-2b, and SJV-3b booster stations, and one at the Martinez meter station, to contain fuel to be used only in the event of a disruption in natural gas delivery.

The two new booster stations require gas, water, and electricity. Rights-of-way for natural gas, water, and electric transmission lines will be 60 feet wide during construction and 30 feet wide during operation. Rights-of-way for access roads for the two new booster stations will be 60 feet during construction and 30 feet during operation. The right-of-way for the new access road for microwave repeater station No. 10 will be 20 feet during both construction and operation. The five other new microwave repeater stations in Segment 4 have access but require electric power. Total right-of-way requirements for all ancillary facilities are about 84 acres during construction and 42 acres during operation (see Table 2-9 for a summary of these facilities).

Two of the five required staging areas will be located at existing stations (Kernridge and Mid stations), while the others will be located at mileposts 46, 117, and 186. About 20 acres will be required for each staging area.

2.1.2 Typical Pipeline Construction Procedures

This section describes the techniques that will be used during construction of the pipeline.

Construction is scheduled to begin in mid-1987 and to be completed in mid-1988. Pipeline construction will be split between two contracts, with one contract covering the 84.5 miles from Weir station to the Caliola station (Segments 1 to 3) and the other contract extending from the Caliola station to the Martinez refinery (Segment 4).

Two construction spreads are planned. Each spread will consist of 130 to 200 personnel. One spread will begin work at the Martinez meter station and proceed south, while the other spread will start at the south end. When the two spreads meet in approximately the middle, the two ends of the pipeline will be welded together to form one continuous line. Construction will average 1 mile/day, or 6 miles/week for each spread. A spread assigned to a given segment will be responsible for all aspects of pipeline construction for that segment. Two partial spreads of 30 to 50 personnel each may be used in congested areas near Martinez and near Kernridge.

The total pipeline construction work force is expected to range up to 500 personnel. Including the construction work force for all ancillary facilities, total construction personnel for the entire project could range up to 800. Construction crews will be housed primarily in motels and at mobile home parks. They are expected to stay at a given lodging for an average of one to three months before moving to another location.

Prior to construction, right-of-way easements will be surveyed and acquired. Landowners will be compensated and the easements will contain provisions or agreements made with the landowners to address their concerns and obtain consent. In addition, all necessary federal, state, and local permits will be finalized before construction begins. Pre-construction activities also include the fine-tuning of the design and location of pipeline facilities based on the environmental review and permit specifications.

Mainline pipeline construction typically involves the following major operations:

Table 2-9

TOTAL RIGHT-OF-WAY REQUIREMENTS FOR NEW ANCILLARY FACILITIES

Feature	Facility*	Right-of-Way Length (Miles)	Right-of-Way Area (acres)	
			Operation	Construction
SJV-2b Booster Station (includes MW Site 8)	Access road	0.1	0.3	0.6
	Natural gas pipeline	3.5	12.7	25.4
	Electric transmission line	0.1	0.3	0.6
	Water pipeline	1.6	5.9	11.8
SJV-3b Booster Station (includes MW Site 11)	Access road	1.0	3.6	7.2
	Natural gas pipeline	0.3	1.0	2.0
	Electric transmission line	0.5	1.8	3.6
	Water pipeline	1.9	6.9	13.8
MW Site 6 (Skunk Hollow)	Electric transmission line	0.5	1.8	3.6
MW Site 7 (Panoche Junction)	Electric transmission line	0.2	0.7	1.5
MW Site 9 (Laguna Seca Ranch)	Electric transmission line	1.4	5.2	10.3
MW Site 10 (Cottonwood Hill)	Electric transmission line	0.2	0.7	1.5
	Access road**	0.3	0.7	0.7
MW Site 12 (Mount Oso)	Electric transmission line	0.1	0.3	0.7
MW Site 13 (Mount Diablo)	Electric transmission line	0.1	0.3	0.7
Total Acreage†			42.2	84.0

*Operation and construction widths of 30 feet and 60 feet, respectively.
**Operation and construction widths of 20 feet.
†Total operation and construction acreage for the pipeline right-of-way will be approximately 937 and 2,498 acres, respectively.

Source: San Joaquin Valley Pipe Line Company.

- Clearing and grading;
- Ditching;
- Stringing;
- Pipe installation (e.g., bending, welding, weld testing, joint coating, lowering-in, and tying-in);
- Backfilling;
- Hydrostatic testing; and
- Cleanup and restoration.

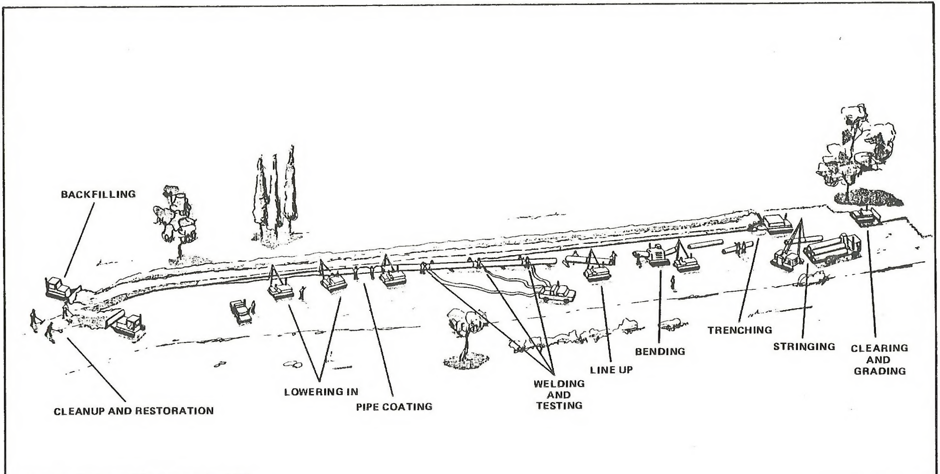
These activities are illustrated in Figure 2-4 and the general procedures are summarized below. This description addresses certain measures which would be applied to reduce disturbances to the environment and minimize public inconvenience during the construction period. These measures are detailed in the Project Description on file with the SLC and have been integrated into this report, but they do not represent the complete range of mitigation measures which will pertain to this project as described in Section 6.

Clearing and Grading

This operation involves the removal of obstacles (trees, brush, large rocks, logs) from the right-of-way and from pipe storage areas, as well as leveling and smoothing the ground within the right-of-way. A typical cross section of a construction right-of-way is shown on Figure 2-5. Access to the right-of-way will be from existing roads. The construction right-of-way will normally be 80 feet in width, with additional temporary work space required in certain areas such as highway, waterway, canal, and aqueduct crossings. This additional space will amount to approximately 0.5 acres on each side of the road, creek, canal, or aqueduct being crossed. Additional temporary work space (a maximum 100-foot-wide right-of-way) may be necessary in areas of steep or rocky terrain, or in areas where ravines or low wet areas are crossed, such as in Contra Costa County near the pipeline terminus.

Routine procedures provide that timber within the right-of-way will be cut and stacked neatly along the right-of-way. However, trees and significant shrubs are so rare along the proposed route that special mitigative measures apply (see Section 6.1.13). If any trees need to be cut, as low a stump as possible will be left, though it will not be higher than 4 inches. Removal of some stumps may be necessary. All brush, stumps, and other debris cleared from the right-of-way will be disposed of by on-site burial, at an approved off-site landfill, or as specified by the landowner.

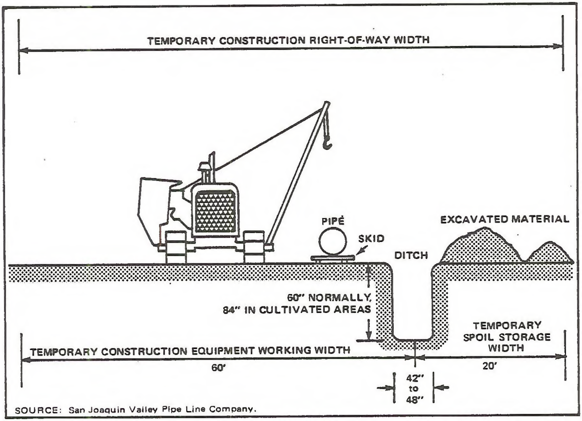
The right-of-way will be graded to the minimum necessary to allow for the movement of construction machinery and for subsequent ditching and pipe installation operations. Grading and excavation will be



SOURCE: Ecology and Environment Inc., 1986

NOT TO SCALE

Figure 2—4 TYPICAL PIPELINE CONSTRUCTION SPREAD



NOT TO SCALE

Figure 2–5 TYPICAL CROSS SECTION OF CONSTRUCTION RIGHT-OF-WAY performed in areas with steep side slopes in order to minimize potential adverse effects on natural drainage and slope stability during construction.

Where fences are encountered along the right-of-way, bracing will be installed at each edge of the right-of-way prior to cutting the wires and installing temporary wire gaps or gates. Gates will be kept closed when not in use. Following completion of construction, the fences will be restored in accordance with the terms of the easement. No gates or cattle guards on established roads over public land will be locked, blocked, or closed without approval from the applicable public agency.

Hard-rock formations may be encountered during grading. Blasting is required for right-of-way preparation under these conditions. Should blasting be required, the construction contractors will follow these procedures:

- Blanketing of blasting (mats) will be used if structures or other utilities are located within 75 feet of the area to be blasted. No blasting will be conducted within 0.25 miles of I-5, the California Aqueduct, or other major canals.

- Special care will be taken to avoid damage to underground utilities or underground watercourses or springs. Blasting will generally be avoided in these areas.

- Landowners or tenants that may be affected will be notified at least 48 hours in advance so that adequate steps can be taken to protect livestock or other property.

- Any loose rock scattered by the blast will be collected and disposed of in the manner specified by the landowner.

- All necessary permits will be obtained prior to conducting any blasting work. All work will be performed in compliance with state and/or local codes or ordinances.

- All work will comply with safety procedures prescribed by the explosives manufacturer as well as accepted practices in the industry, including ANSI A10.7, Safety Requirements for Use of Explosives in the Construction Industry, and ANSI/NFPA 495, Code for Manufacturing, Storage and Use of Explosive Materials.

Ditching

After clearing and grading, the ditching (trenching) operation will begin. Ditching includes all excavation work required to provide a channel of specified width and depth for the pipe, and involves the use of a ditching machine and, in some cases, a backhoe. Hand digging will be used to locate and cross buried utilities, where appropriate. Should extremely rocky terrain be encountered, blasting may be necessary and the procedures described above under clearing and grading will be followed. Ditches will generally be 84 inches deep and about 42 to 48 inches wide across cultivated lands, and 60 inches deep and 42 inches wide across other lands. Minimum cover requirements will be 36 inches in soil and 18 inches in rock. Sixty inches of cover will be provided in cultivated lands.

In areas where intensive agriculture is practiced, topsoil and underlying soil materials will be separated and restored in compliance with federal, state, and local agency requirements, as well as landowner requirements. Soil separation generally involves two passes with the ditching machine--the first pass, to a depth of about 40 inches, to remove the topsoil and the second to remove the underlying soil materials. However, topsoil may be so shallow that special mitigation applies (see Section 6.1.2). Topsoil and the underlying soil materials will be stored in separate piles in areas where soil separation is necessary.

The stockpiled material from the ditching operations will be cleared of organic or other foreign materials that may produce an unsatisfactory backfill. Gaps will be made in the rows of excavated soil to allow for drainage. Vehicle crossovers will also be provided where necessary. The maximum length of open ditch will be limited to 6 to 8 miles for each spread in open country, and 3 to 5 miles across irrigated land and more developed areas. A trench will remain open no more than 30 days in a given area.

To ensure vehicle safety, it may be necessary to construct temporary bridges or culverts across drainage ditches and irrigation canals on the working side of the right-of-way; these would be required for a maximum of 30 days at any one location. No diversion dams will be required. At Pacheco Creek in Contra Costa County, because of space limitations, specialized waterway construction methods will be used, as summarized in Section 2.1.3.

Stringing

Stringing, or placement of pre-coated pipe, valves, and fittings from the storage yards along the right-of-way, can occur either before or after trenching. Pipe will be transported to the right-of-way by trucks and unloaded by tractors fitted with side booms. The stringing operation will be conducted in a manner to prevent damage to the protective coating on the pipe, through the use of padded forks on fork lifts and aluminum end hooks that hook inside the ends of the pipe so that they do not touch the pipe coating.

Pipe Installation: Bending, Welding, Coating, Lowering-in, Tying-in

The pipe will be delivered to the construction area in straight sections (joints), and bent to conform to minor changes in the direction of the pipeline alignment and the contours of the ditch. Individual joints of pipe will be bent to the desired angle in the field using a track-mounted, hydraulic, pipe-bending machine and placed on supports. The inside of the pipe will be swabbed-clean and joints will be clamped in preparation for welding.

Welding is a critical phase of pipeline installation and requires the joining of the various pieces of pipe in a manner that gives the welded joint strength and serviceability equal to or greater than the pipe itself. Welding will be performed by qualified welders as identified in API Standard 1104, "Standard for Welding Pipe Line and Related Facilities."

API Standard 1104 describes the accepted industry standards for welding tests; these standards will be followed for this project. Visual inspection of welds and welding operations by qualified welding inspectors will be performed to minimize defects and indicate when further examination of certain welds is advisable. Radiographic examination of selected welds will be made by placing bonding film, which is sensitive to X or gamma rays, in close contact with a weld and exposing the weld and adjacent pipe metal to these rays. The resulting pictures will be examined by trained inspectors to identify any defects. Defective welds will be repaired as outlined in API 1104 and as directed by the welding inspector. If the X-ray tests show a pattern of defects, then all the welds in that stretch of pipe will be inspected and repaired, if necessary.

Although DOT's minimum requirement is 10%, at least 25% of the welds will be inspected radiographically. In addition, radiographic testing of all welds is required in sensitive areas such as railroad, public road, or major waterway crossings and at pipeline tie-ins. All radiographic inspections will be performed as outlined in DOT Title 49 CFR 195, "Transportation of Hazardous Liquids by Pipeline."

Following welding, the welded joints will be coated with epoxy to protect against corrosion. Any other surface damage to the precoated pipe will be repaired by field coating. Acceptable padding material, such as sand bags, will be inserted in the trench if necessary to protect the pipeline. Ditch padding is not necessary in areas where soils do not present a risk to the integrity of the pipe.

Side-boom tractors are then used to lower the long sections of welded pipeline into the ditch. Inspections will be conducted to ensure that the pipe conforms to the bottom of the ditch and that the bottom of the ditch is free of sharp rocks or debris that could damage the coating. Any section of pipeline that does not follow bends in the trench will be removed, and a new section will be bent, rewelded, and lowered in. The pipeline sections are then joined (tied-in) by tie-in welds, typically done by the most experienced welders in each spread. Finally, the cathodic protection system components, such as leads, anode wires, etc., are installed.

Backfilling

Once the pipe is lowered into the ditch and tied-in, the pipe is covered. Backfill will be placed using proven techniques so as to avoid subsequent settlement that would leave a surface depression, and to avoid damaging the surface of the pipe. Finely graded materials from ditch excavation, which provide support around and under the pipe, are backfilled first; these preclude voids and large rock or clods falling against the pipe coating. The natural subsoil is then returned to the trench. Finally, in areas where topsoil has been segregated, the original topsoil is placed over the subsoil, leaving a small temporary crown or berm over the ditch line to allow for some settling. Extra soil, should there be any, will be disposed of in a Class III landfill unless otherwise directed by the landowners.

Hydrostatic Testing

The pipeline will be hydrostatically tested after backfilling and after all construction work that would affect the pipe has been completed. The pipeline segments will be filled with water and held at a specified pressure for a specified length of time to verify the integrity of the entire pipeline system.

Freshwater will be used for hydrostatic testing, and no biocides or other chemicals will be added to the test water. The water will be obtained through agreements consistent with local, state, and federal regulations. Available sources include aqueduct water and local groundwater supplies. The estimated volume of water required for testing of the proposed pipeline is 63 acre-feet. The same water will be used to test different sections of the pipeline by pumping it forward from one section to the next. Internal test pressures will be 125% of the maximum daily operating pressure in accordance with DOT regulations for liquid petroleum pipelines (DOT Title 49 CFR 195). Records of tests will be made using recording pressure gauge charts that will be dated, identified, and verified by the responsible operators and inspectors. The test water will be disposed of or discharged in accordance with federal, state, and local regulatory requirements.

Cleanup and Restoration

The final phase of pipeline construction is cleanup and restoration. All surplus soils, vegetation, and construction debris will be disposed of in a manner specified by landowners, tenants, or lessees, or will be removed from the right-of-way and disposed of in a Class III landfill. Salvageable materials, such as sections of pipe, will be sold for scrap and recycled.

Restoration of the right-of-way will be initiated during backfilling operations. Further breaking-up of soil clods and smoothing the earth surface will be accomplished using disc harrows or other equipment. Runoff will be controlled by the placement of water bars or terraces, soil-filled sacks, rock riprap, or other materials. The need for these techniques is anticipated in areas of high potential susceptibility to water erosion. Final grading will minimize potential effects on natural drainages and return the construction right-of-way to natural contours. Where terraces or diversion dams are cut, the areas will be restored to as near original conditions as practicable, consistent with the restoration of natural drainage patterns upstream or downstream of the alterations. The right-of-way area not in cultivation will be seeded with grass to establish vegetative cover and to control erosion. Croplands will be restored so that normal cultivation can be resumed. Cleanup and restoration activities will be performed in conformance with landowner requirements. Project operation normally will require a 30-foot permanent right-of-way to be maintained clear of woody vegetation. Agricultural use of the permanent right-of-way will be allowed.

All final repairs or replacement of fences and gates will be performed during cleanup and restoration. Markers showing the exact location of the pipeline will be installed at all road crossings and at most property lines and will contain emergency information. Aerial location markers also will be installed. Placement of location markers and information provided on them will be in accordance with appropriate regulations.

2.1.3 Special Construction Techniques

Special construction techniques which will be used at highway, railroad, and waterway crossings are described below.

Highway and Railroad Crossings

Major highways and railroads will be crossed primarily by horizontal boring or augering. Where required, a pipe casing or sleeve will be inserted and a complete section of pipeline placed therein. As part of this procedure, it will be necessary to excavate a pit (usually 10 feet x 30 feet) off the road large enough to accommodate equipment on each side of the crossing. All construction activities near highways and railroads will be conducted in a work area of 100 feet x 200 feet. Traffic disruptions will be minimized. In addition, equipment will be operated in a manner designed to prevent injuries to workers and to the public.

All road crossings will be completed in accordance with applicable regulatory requirements and API 1102, "Recommended Practice for Road Crossings."

The pipeline will be installed across lightly traveled and unimproved rural dirt roads by the open cut method. All such construction operations, including repair and surface restoration, will be completed in one day, although construction of approved temporary detours may be required.

Waterway Crossings

Pipeline construction techniques across streams and canals may vary with the volume of flow, channel size, and other characteristics; in any case, techniques for canal crossings will be specified in California Department of Water Resources (DWR) permits, while stream crossings are under the jurisdiction of the California Department of Fish and Game (CDFG). Intermittent streams and dry washes will be crossed in the dry season when possible, using conventional dryland pipeline construction methods. If these crossings are required during the winter rainy season, they will be done during periods of low flow. The proposed underground crossings of aqueducts, larger irrigation canals, waterways with special engineering requirements, and larger streams will involve specialized techniques. The major waterways crossed by the proposed route are listed in Table 2-10.

The flow of perennial streams, including Pacheco Creek, will be maintained while the trench is excavated from the stream bank using equipment such as a dredge bucket, which will be pulled across the bottom repeatedly until the trench is the required depth to bury the pipe. The pipeline will be placed below scour depth and, at a minimum, the trench will be sufficiently deep to allow at least 5 feet of cover below the natural channel bottom, depending upon CDFG permit specifications. Excavated material will be stockpiled on the bank above the ordinary highwater mark. The pipe will be weighted to eliminate instability in water-saturated zones. After pipe installation, the trench will be backfilled with originally excavated material or suitable imported material as specified by applicable permits. The banks will be backfilled, stabilized, and restored. Stabilization and restoration of the banks of intermittent streams will be accomplished by grading to original contour and revegetating. At Pacheco Creek, the largest natural creek crossed, the stream bank will be restored to original contours and stabilized with soil or concrete-filled sacks, riprap, or vegetation to reduce erosion.

The California Aqueduct (milepost 160.0) and the Delta Mendota Canal (milepost 163.3) will be crossed by constructing the pipeline on existing pipeline suspension bridges (see Figure 2-6). The bridges include sufficient space for utilization, and their use has been declared acceptable by the bridges' owners. The pipe will be constructed under all other waterways using directional drilling. Because it avoids disturbance to the channel bottoms, banks, or surfaces, directional drilling is similar in purpose to highway or railroad boring. However, directional drilling uses a rotating drilling rig with special tools that allow for change in drilling direction and depth, while bored crossings typically remain horizontal. Crossings using directional drilling are usually deeper than bored road crossings, and will require approximately one week at each site.

2.1.4 Proposed Station Construction/Modification

Booster/injection stations, microwave stations, and the Martinez meter station will be constructed or modified separately from the pipeline. Construction work on the six new or modified booster/injection stations will be performed under contracts independent of pipeline construction.

After the required permits are obtained, construction will occur in four stages: (1) site preparation, (2) equipment installation, (3) testing and start-up, and (4) cleanup. Site preparation on the approximately 3 acres of land includes site survey, clearing, grading, road construction, erection of fences, and pouring of concrete foundations. All electrical conduits and any plumbing must be placed in the concrete forms before the concrete is poured.

The second phase involves equipment and piping installation and electrical hook-up. At the booster station sites, a prefabricated

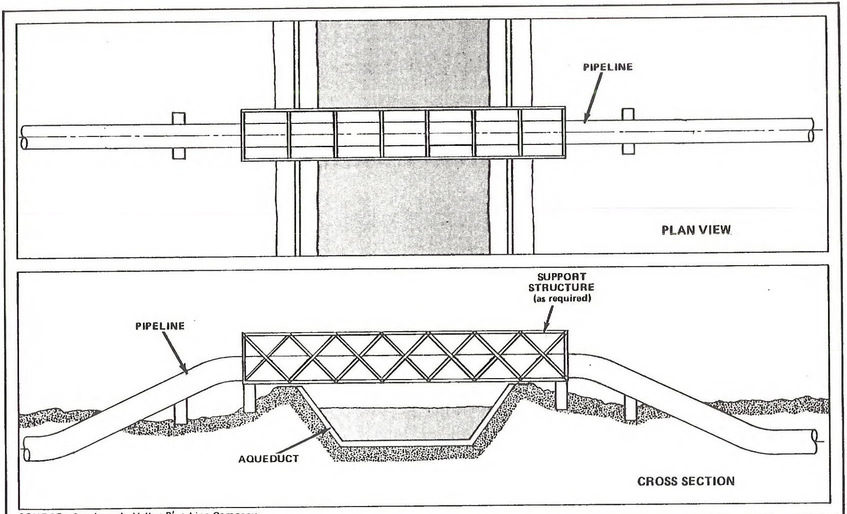
Table 2-10

MAJOR WATERWAYS CROSSED BY THE PROPOSED PIPELINE

Waterway	County	Approximate Milepost
500 Canal	Kern	21.3
415 Canal	Kern	25.9
California Aqueduct	Kern	32.0
California Aqueduct	Kings	60.8
Pleasant Valley Aqueduct	Fresno	84.6
California Aqueduct*	Merced	160.0
Delta Mendota Canal*	Merced	163.3
California Aqueduct	Merced	165.4
Pacheco Creek	Contra Costa	256.8, 257.1
Contra Costa Canal	Contra Costa	254.1

*Proposed crossing is by existing overhead suspension bridge; all other crossings are proposed to be underground.

Source: San Joaquin Valley Pipe Line Co.



SOURCE: San Joaquin Valley Pipe Line Company.

NOT TO SCALE

Figure 2–6 TYPICAL ABOVE-GROUND AQUEDUCT CROSSING fiberglass/metal control building will be unloaded at the site and placed on the concrete foundation. The pump units and other equipment will then be placed in the station according to the design drawings. At the same time, the piping, fittings, and flanges will be welded together, and the electrical conduits and wiring will be installed. The fabricated piping sections will be put in place and then connected to the pumping units, heater, and the mainline pipe.

The third major phase of station construction is testing and start-up. At a booster station, the piping will be filled with water, pressurized, and observed for leaks. Each electrical power and control circuit will be checked and tested to verify operability. The turbine and stand-by generator unit will be started and checked out. All safety devices will be tested and calibrated. After all testing and check-out is completed, valves will be opened and oil will be pumped into the stations and mainline.

For a microwave station, the second phase will consist of erection of the tower and antennas, and electrical hook-up. The third phase will include alignment of the antennas and testing of the communication channels.

The fourth phase of station construction involves cleanup. The applicant and construction contractor will inspect the entire station and write up a list of unfinished items. The contractor will then finish or repair the items listed and complete the final cleanup of all trash and left-over materials.

Modifications of the booster/injection stations will be performed within the existing facility areas. It is estimated the total construction work force will be 45 personnel for each of the pump stations and 30 for the Martinez meter station. Construction will be done in stages, and may take eight to 10 months to complete. The nature of the construction tasks will determine the number of workers required at these sites at any one time.

The ancillary facilities will be similarly constructed. Clearing and grading will precede trenching for natural gas and water lines; electrical transmission facilities will also require clearing and grading of the right-of-way prior to their installation.

2.1.5 Operation and Maintenance

Following commissioning and initial start-up, operation of the proposed pipeline system will be continuous. Once oil starts flowing, it will continue unless interrupted by unforeseen circumstances. Shell Oil Company's flowing volume may vary depending on the requirements of the Martinez refinery, but will not exceed the refinery's maximum capacity of 120 MBD.

Specific operation and maintenance procedures will be developed for the proposed pipeline facilities. Manuals explaining these procedures and training will be made available to all operating personnel. All manuals and operating procedures will comply with DOT Regulation

49 CFR 195, "Transportation of Hazardous Liquids by Pipeline: Minimum Federal Safety Standards," and state requirements such as the California Hazardous Liquid Pipeline Safety Act. The Applicant anticipates that 10 to 12 full-time personnel currently employed by Shell will be required for routine operation and maintenance of the new pipeline system.

The major features of the operation and maintenance program are summarized below.

Oil Spill Contingency Plan

An Oil Spill Contingency Plan for the project, as required by DOT Regulation 49 CFR 195, has been submitted to the SLC and is included in Appendix B to this document. The contents of the plan are summarized in Section 4.2.15; key features of the control system are discussed below.

Control System

The San Joaquin Valley Pipeline will be operated from the Shell Oil Company Pipe Line control center in Anaheim, California. The Anaheim control center is a computer-based supervisory system with a second, fully-redundant computer which will provide immediate, automatic back-up in the event of a failure in the primary system. Materials will be stored in areas close to the pipeline to enable quick repairs in the event of a leak. The communication system for the proposed project will include each of the booster/injection stations. The new booster stations in Segment 4 will be remotely controlled from the Anaheim control center, while the stations at existing locations are and will continue to be locally controlled. Shutoff valves on either side of all booster/injection stations and at the Martinez meter station will be automated; those along the pipeline will be manually operated.

Three primary methods will be used to detect leaks: pipeline operator controller judgment, computer software detection tools, and air surveillance of the pipeline. These methods provide for continuous monitoring of discharge pressures at pump stations to ascertain whether changes in pressure result from normal variations or a potential leak, and line-volume balancing, which is a comparison of incoming volumes from the injection stations with the amounts being delivered at Martinez.

An oil movements controller will be on duty 24 hours a day. The controller's sole responsibility will be to monitor the pipeline for proper and safe operation, including detection of leaks. Information such as pipeline pressure, flow rate, and temperature will be transmitted to the control center from field locations and updated with real-time data approximately every 15 seconds. The controller will analyze incoming data to monitor current operating conditions, will determine abnormal conditions, and can take appropriate action, including shutting down the pipeline if necessary.

To assist the controller, a leak detection program will be installed in the computer at the Anaheim control center. The proposed project will be monitored by a proprietary Shell program called "Line Balance," which will be customized for the characteristics of the project. This program compares the volume of crude oil measured into the pipeline against the volume measured out at the end of the pipeline. This ongoing comparison is done for the most recent 60 minutes and is updated continuously every minute. When the volume of oil measured entering the system compared to the volume of oil which is received at the refinery indicates a discrepancy of a certain size, an alarm will be activated. The controller will then review all operating data to determine if a leak has occurred and will take appropriate action.

All remotely controlled locations will also be provided with stand-by power systems to maintain remote-control operation and shut-down capability in case of a power failure. Facilities to be controlled will be connected via the microwave communications system.

Oil Spill Potential

Since the proposed pipeline includes mainline shut-off valves no more than 30 miles apart, the section of the pipeline in which a leak is suspected can be isolated and shut down. Under a worst-case scenario of a total pipeline failure, the maximum potential gravity spill volume would be a drainage volume of 36,000 barrels. This figure is based on analysis of elevational profiles and distance between valves to determine the maximum volume that could drain from the ruptured pipeline by gravity.

The maximum (worst-case) volume of crude oil that would be pumped from the pipeline before detection by the controller at the Anaheim control center will be approximately 870 barrels (i.e., significantly less than the worst-case gravity spill). This leak volume could only occur during about two hours per week, when the pipeline flow rate and operating pressure will change to accommodate movement of a special lube crude. The following assumptions were used in estimating the worst-case leak volume:

• Instrument inaccuracy (± 2%, at 6667 bph)	266 BBL
• Line pack variation (80 MBD to 160 MBD within 60 minutes)	300 BBL
• Tolerance to prevent false alarms	84 BBL
• Controller decision/reaction time (2 minutes)	220 BBL
Total	870 BBL

This volume (detection volume) should be added on to the drainage volume. The worst-case spill volume before detection during the remaining 166 hours (99%) of the week would be less, only 570 barrels. Volumetric imbalance due to line pack would not be a factor during this period. Volumes due to instrument inaccuracy, false alarm prevention, and decision/reaction time would be the same as above.

Storage tanks at the Weir and Mid stations will also be metered and equipped with overflow control devices. In addition, these tanks will have dikes designed to contain 110% of the maximum tank volume.

Systems safety and reliability and oil spill potential and effects are further discussed in Sections 4.2.14 and 4.2.15.

Surveillance and Maintenance

An operations and maintenance plan and schedule will be implemented to monitor and ensure safe pipeline operation. The 30-foot-wide permanent right-of-way, which will largely have been returned to its original land use, will be used to provide access for any necessary pipeline maintenance. The pipeline and right-of-way will be inspected weekly utilizing aerial surveys to find small leaks that would not be detected by instrumentation. Such small leaks include pinhole leaks due to corrosion or drip-type leaks from a pipe fitting or flanged connection. Since the proposed pipeline will be constructed primarily in an existing utility corridor, air surveillance by other utilities in the same corridor may actually provide information about pipeline conditions at more frequent intervals. No routine on-the-ground inspection is planned, but maintenance crews will be working up and down the pipeline regularly and in the process will observe any maintenance and/or repair requirement.

The air surveys and ground maintenance work will identify potential right-of-way use encroachments, pipeline exposure and mechanical damage, and other conditions, such as excessive vegetation growth on non-agricultural portions of the right-of-way which might constitute a safety hazard. Should vegetation need to be removed, mechanical equipment, such as a brush hog, will be used to mow the right-of-way as needed, most likely only in the northernmost 25 miles of the route. Herbicides will not be used to manage the vegetation on the right-of-way. Any requirements for remedial erosion control or restoration work will be identified and implemented before significant problems develop. All valves and valve actuators will be operated, inspected, and lubricated at least once every six months.

2.1.6 Abandonment

The economic life of the proposed project is estimated to be 30 to 40 years. At the end of operation, the oil in the underground pipeline will be removed and delivered to the refinery. The pipeline will be filled with water, sealed, and abandoned in place. The purpose of filling the pipeline with water, which will contain rust inhibitors, is to slow down or eliminate internal corrosion and to give greater structural strength to the abandoned pipeline than if it were left hollow. All above ground facilities and foundations will be dismantled and removed. Equipment will be salvaged for reuse to the extent possible. Refuse and unsalvageable materials will be disposed of at authorized disposal sites. The above-ground sites will be restored in accordance with applicable agency regulations and permit stipulations.

2.2 PROPOSED ALTERNATIVES

A range of alternatives to the proposed action was considered during the application process, four of which were identified as feasible alternatives to the proposed action:

- Alternative pipeline routes;
- Alternative number and locations of new booster stations;
- Alternative power/fuel sources at new and existing booster stations; and
- Overhead aqueduct crossings.

These alternatives will be evaluated to the same level of detail as the proposed project. The no-action alternative, which likewise requires evaluation, is described in Section 2.3. Other alternatives initially considered but later rejected are referred to in Section 2.4. These alternatives were determined to be incompatible with the goals and objectives of the project; or would cause other, unacceptable impacts without environmental benefits; or were remote or speculative in nature; or would require an inordinate amount of resources to analyze in detail. The elimination of alternatives from further analysis in this EIR/EIS based on these types of constraints is consistent with CEQA and NEPA guidelines.

2.2.1 Alternative Pipeline Routes

Two alternative pipeline routes were evaluated: the Combination Route and the Contra Loma Route (see Figure 2-7). These alternative routes were developed:

- To avoid potentially environmentally sensitive areas;
- To utilize existing utility and transportation corridors as much as practicable;
- To avoid prime croplands, vineyards, and orchards; and
- To accomplish project objectives in a technically sound and cost-effective manner.

Each of the alternative routes is described below.

Combination Route

The Combination Route consists of approximately 44 miles of 14-inch-diameter pipeline. It would take the place of the looped segment (Segment 3) of the proposed route between Mid station and the Caliola booster station, i.e., between mileposts 40 and 83.4 of the

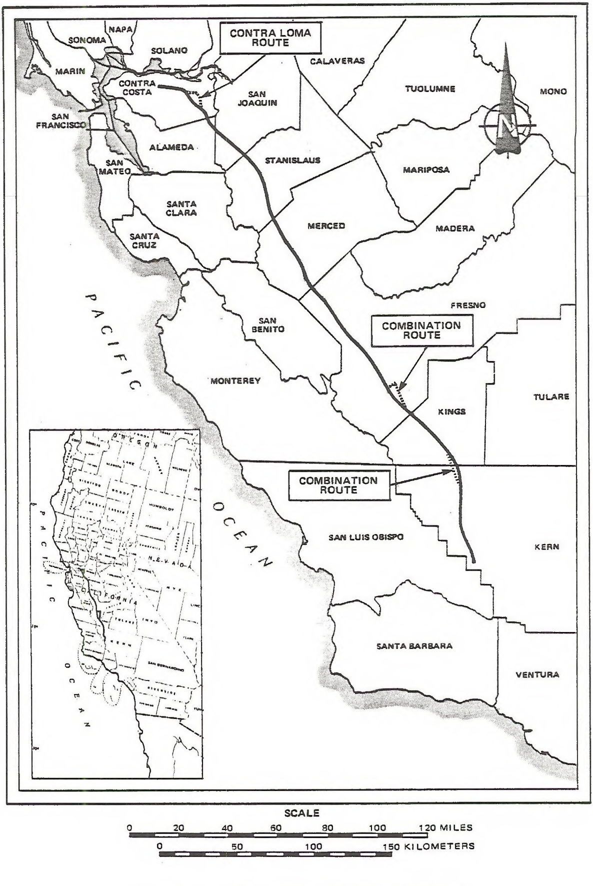


Figure 2–7 ALTERNATIVE ROUTE LOCATIONS

proposed route. The Combination Route was selected as an alternative because it is aligned parallel and adjacent to Interstate Highway 5 (I-5), and runs adjacent to utility and transportation corridors slightly more closely than the proposed route. The Combination Route deviates less than one or two thousand feet from the proposed route between mileposts 40 and 49 and between mileposts 76 and 83. It has a distinct identity between mileposts 76 and 83, where it is aligned just to the east of the proposed route and adjacent to I-5.

This alternative would not require any changes over the proposed action in injection and pumping, or in communications facilities and related ancillary facilities. It would be about 0.5 miles longer than the equivalent portion of the proposed project and, for this reason, could have slightly higher construction and operation costs.

Contra Loma Route

The Contra Loma Route, a 3.5-mile bypass in Contra Costa County near the northern terminus of the pipeline, was developed to avoid potential landslide areas in this portion of the county. This alternative route is aligned about 0.5 miles to the north and east of the portion of the proposed route and crosses less rugged terrain. It corresponds with mileposts 240.6 to 244 of the proposed route in this area (Segment 4). Because it crosses less rugged terrain, the Contra Loma Route would result in lower construction and operation costs, but these advantages could be offset by more difficult right-of-way acquisition due to the proximity to developed areas.

2.2.2 Three New Booster Station Alternative

Another alternative under consideration is a project with three new booster stations (SJV-2, SJV-3, and SJV-4; see Figure 2-8) instead of the two new booster stations in the proposed action (SJV-2b and SJV-3b). The advantage of this alternative, which would add one more new booster station to Segment 4, is that pumping and heating facilities could be sized for greater throughput efficiency and more economical operation. Additionally, this alternative would allow the option of a 20-inch pipe diameter for Segment 4, or it could be built with 24-inch pipe diameter as in the proposed action. Either the 24-inch or the 20-inch pipe could transport 120 MBD through Segment 4 of the pipeline. The alternative would utilize 19 mainline block valves--two more block valves than for the proposed action. This alternative would add one more microwave tower than the proposed action, to be located at booster station SJV-4.

20-inch-Diameter

The addition of a booster station accompanied by a block valve for the 20-inch-diameter pipe has a potential environmental advantage because, in the event of a worst-case pipeline rupture in Segment 4, a smaller volume of oil would be spilled than with a larger diameter pipe. For example, for the worst-case scenario of a pipeline break in Segment 4 between the two block valves with the greatest difference in elevation, the maximum oil spill over the 173-mile stretch would be

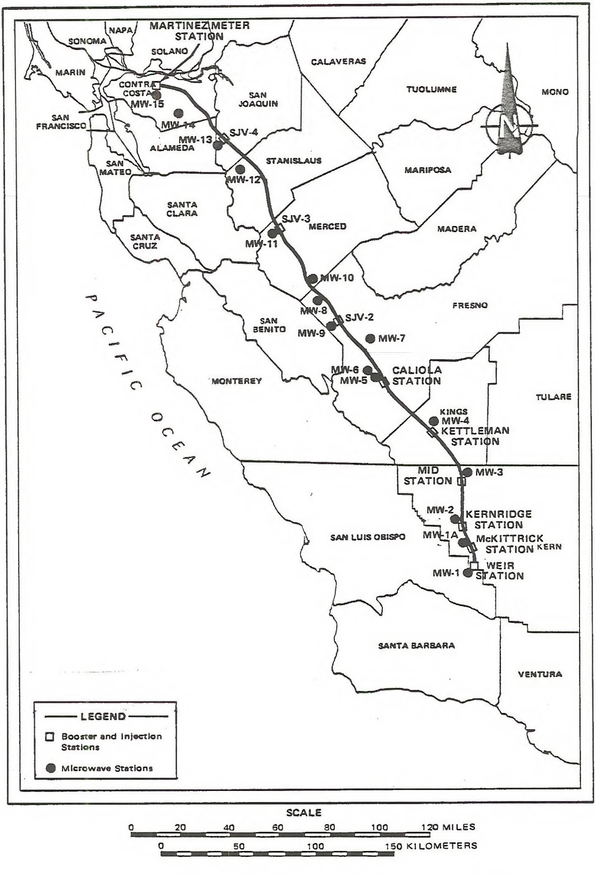


Figure 2—8 ALTERNATIVE BOOSTER STATION CONFIGURATIONS

reduced from about 24,000 barrels to about 16,500 barrels as a result of the smaller (20-inch) pipeline. However, this alternative would not modify the maximum potential oil spill for the project, which has been estimated at 36,000 barrels, because this maximum potential spill location is for Segment 2 (the 18-inch pipe), which is unaffected by this alternative.

24-inch-Diameter

The additional booster station alternative could also be built with the proposed 24-inch pipe in all of Segment 4. The selection of pipe diameter would depend not only on safety considerations, but also on cost and engineering factors, because the proposed 20-inch pipe would require substantially more powerful pumps and higher pressures, although slightly less heating, than 24-inch pipe (see Table 2-11).

2.2.3 Alternative Power Source Configurations

In view of possible disruptions in the supply of natural gas, and because electric motors are cleaner and less complex than turbines using waste heat, two alternative pump and heater power source configurations require evaluation in addition to to the proposed action:

	Alternative 1	Alternative 2	(Proposed Action)
Pumps	Electric motors	Electric motors	Gas turbines
Heaters	Crude-oil-fired heaters	Natural-gas-fired heaters	Natural-gas-fired heaters with waste heat from gas turbines

Implementation of alternatives 1 or 2 would require that high-voltage electric transmission lines from the Pacific Gas and Electric Company be constructed to new booster stations and to the Caliola station. Alternative 2 requires natural gas supply lines comparable to the proposed action, while Alternative 1 would not require natural gas supply lines.

Under Alternative 1, the crude oil for the heaters would be taken from the proposed pipeline and stored in a small tank (less than 1,000 BBL) at each station. The oil that would be utilized for heating would have a sulfur content of 0.7 to 1.2% by weight. The fuel consumption rate at each station would range between 0 and 190 gallons/hr, depending on the season of the year and the flow rate through the pipeline, but fuel requirements would average approximately 90 gallons/hr.

Table 2-11

COMPARISON OF HORSEPOWER AND HEATER REQUIREMENTS
FOR DIFFERENT PIPELINE DIAMETERS USING
THE THREE NEW BOOSTER STATION ALTERNATIVE

	Horsepower*		Heater (million BTU/hr)	
Station	24-inch pipe	20-inch pipe	24-inch pipe	20-inch pipe
Mid	1,600	2,700	13	5
Kettleman	**	**	**	**
Caliola	1,400	2,500	13	10
SJV-2	1,400	2,500	13	10
SJV-3	1,400	2,500	13	10
SJV-4	1,400	2,500	13	10

*Using gas turbine.
**No additional requirements.

Source: San Joaquin Valley Pipe Line Company.

2.2.4 Alternative Aqueduct Crossing Technique

The project could be developed by constructing new overhead suspension bridges as an alternative to underground crossings of the aqueducts traversed by the project. The basis for evaluating this alternative is that the California Department of Water Resources (DWR), which maintains jurisdiction over San Joaquin Valley aqueducts, has expressed strong reservation about the proposed underground crossings. This alternative aqueduct crossing technique could be used at six of the ten major water crossings (see Figure 2-9) listed in Table 2-10 in Section 2.1.2. It is not considered for the crossings of Pacheco Creek, which is not an aqueduct under DWR jurisdiction. Use of the existing suspension bridges at the other two canal crossings--the California Aqueduct (at milepost 160.3) and the Delta Mendota Canal (milepost 163.8)--are already part of the proposed action.

2.3 NO-ACTION ALTERNATIVE

The no-action alternative implies that neither the pipeline, its ancillary facilities, nor any of its alternatives would be built. This would occur if the proposed action and all of its alternatives were denied the permits or approvals necessary for their construction.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

In addition to the alternatives described above, a number of other alternatives were initially evaluated and eliminated. These included additional pipeline route alternatives, an alternative communications technique, and pipeline insulation. These alternatives, and the primary reasons for their elimination, are summarized below.

2.4.1 Alternative Routes

Various alternative routes were initially evaluated for both the southern (Segments 1, 2, and 3) and northern (Segment 4) portions of the proposed action. These alternative routes, which are described briefly here, were eliminated prior to detailed analysis because of overriding environmental, engineering, or economic constraints.

During initial project development, several alternative routes were considered in the southern project area, including a route east of and adjacent to the I-5 route; a route west of and adjacent to the I-5 route; the Texaco pipeline route; and the Lost Hills Road route. All of these routes were eliminated from further consideration because they would have required diagonal crossings of lands under cultivation, more irrigation trench and aqueduct crossings than the proposed route, and more crossings of I-5. In addition, these routes would have entailed a greater number of highway and canal crossings; more extensive construction in areas of more rugged terrain; more difficult right-of-way acquisition problems; and constraints in terms of access to the right-of-way and ancillary facilities.

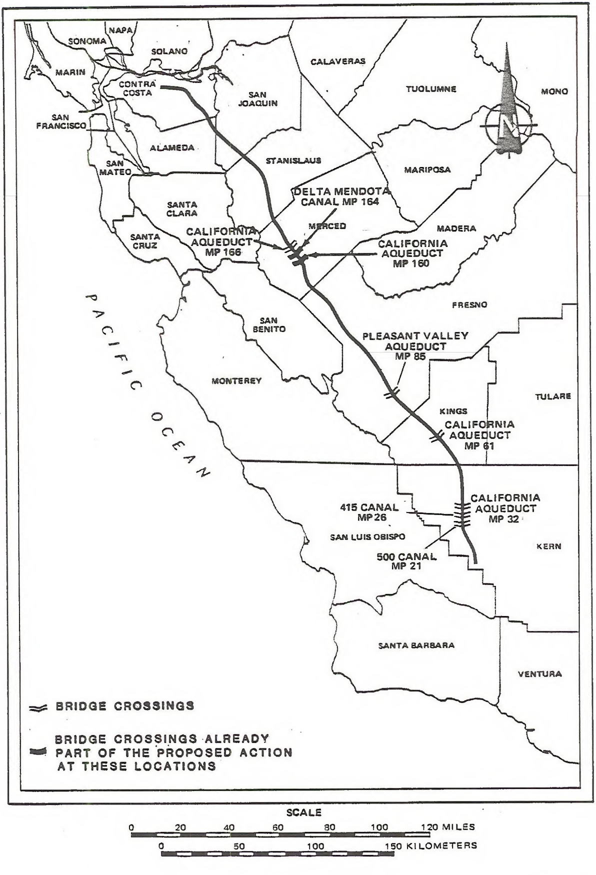


Figure 2-9 ALTERNATIVE OVERHEAD AQUEDUCT CROSSING LOCATIONS

Highway 33 Alternative

A Highway 33 Alternative, consisting of approximately 62 miles of 24-inch pipeline, was considered in Kern and Fresno counties because it would have provided a more direct route than the corresponding segment of the proposed route between the end of Segment 1 (milepost 21.6) and the beginning of Segment 4 (milepost 84.5). This alternative also had the advantage of adjoining existing pipeline and electric corridors, as well as following existing ranch roads and property boundary lines, to a greater extent than the proposed action.

However, this alternative was rejected because it did not meet the needs of the project due to a reduction in operational flexibility. This reduction in flexibility results from not looping the existing 14-inch pipeline between Bakersfield and Caliola, which would preclude the use of existing ancillary facilities. For example, the alternative would bypass the Mid booster station and would result in the loss of a control point over Segments 2 and 3 to regulate the varying inputs of oil into the pipeline. These reasons were considered sufficient to eliminate the alternative from in-depth evaluation.

Texaco North Alternative

The Texaco North Alternative was identified as a potential route which would have utilized an additional 25 miles of existing corridors in Contra Costa County (Segment 4). It would follow an existing Texaco crude oil pipeline, a Pacific Gas and Electric Company transmission line, and an unimproved ranch road.

This alternative was eliminated from further evaluation because it would have substantially higher construction and operation costs due to an increase of 1,200 feet in the maximum elevation of the pipeline.

Additionally, this route would cross erosion-prone hillsides and rugged terrain, which have caused operation and maintenance problems for existing utilities presently using the corridor.

Other Alternative Routes

Five additional alternative routes in Contra Costa County were initially evaluated and eliminated from further consideration because of confirmed or potential slope stability problems, the crossing of or encroachment upon expanding residential areas, disruption of sites with known cultural resources, and the crossing of regional parks and other special-use areas.

An alternative route on the eastern side of the San Joaquin Valley was also evaluated on a conceptual level to determine whether impacts to environmentally sensitive features such as habitat for special status wildlife species could be eliminated. However, it was determined that such a route would not significantly reduce environmental impacts, in addition to greatly increasing socioeconomic and land use impacts from potential oil spills because of the area's high value agricultural crops and the type of irrigation practiced.

2.4.2 Alternative Transportation Methods

Other means of transporting oil from Weir to Martinez were considered, but rejected because of greater environmental impacts, logistical difficulties, and higher cost compared to pipeline transport. Alternative transportation means initially considered included trucks, railroad, and tankers. About 600 trucks would be required to travel between Weir and Martinez each day, or, alternatively, three sets of trains containing 72 cars each would be required, in order to deliver 120 MBD to Martinez. Compared to pipeline transport, either of these transportation methods would cost more, would increase highway or rail traffic, and would greatly increase the risk of oil spills resulting from accidents or oil transfers. Marine transport was rejected because of its impracticality; the oil-production areas associated with the project are landlocked, and this alternative would therefore require that oil be transported to the coast, either by truck, rail, or pipeline, before it could be loaded onto tankers. Any route to the coast would have to cross the rugged Coastal Ranges.

2.4.3 Fiber-Optic Cables for Communication

The use of fiber-optic cable laid in the pipeline trench was considered as an alternative to the microwave communication system to relay pipeline information to Shell's control center in Anaheim. This option would cost about twice as much as the proposed network of microwave towers. The use of fiber-optic cable would avoid the towers' visual impacts, but a review of available information determined that a communication system based on fiber-optic cables has an unproven record of reliability in cross-country pipeline applications. Also, there was substantial concern about fiber-optic cable failures (splices, protective cover deterioration, third-party damage), the need for repairs, and repair time. In addition, according to the applicant, the technology available to pinpoint a damaged cable is costly and time-consuming.

2.4.4 Pipeline Insulation

The proposed pipeline will not be insulated. The alternative use of pipeline insulation for the purpose of energy conservation was eliminated for several reasons. Economic analysis did not indicate an economic benefit to the project. The original cost of insulated pipeline would be higher than for an uninsulated pipeline, even though long-term transportation costs per barrel of crude oil would be about equal. A few potential disadvantages of insulation were identified. These included the risk of water absorption by the insulation in wet areas; the insulation deteriorating due to the moisture and/or loss of its insulating qualities; and subsequent disbonding from the pipe.

2.5 INTERRELATIONSHIPS WITH OTHER PLANNED OR PROPOSED PROJECTS

As a first step in assessing cumulative impacts of the San Joaquin Valley Pipeline, projects potentially interrelated with the proposed action were evaluated. However, inclusion criteria for planned or proposed projects for cumulative impact analysis are not well defined for linear projects, such as a 258-mile pipeline. Therefore, the evaluation of potentially interrelated projects was limited to major projects which are currently proposed or have a reasonable likelihood of being proposed in the near future, and which:

- Would compete for the same resources near the originating or terminating points of the proposed action; or

- Would add significantly to the proposed action's short-term (construction) impacts due to possibly overlapping construction schedules; or

- Would add significantly to the proposed action's long-term (operation) impacts.

In formulating the list of potentially interrelated projects, therefore, size, type, and proximity to the proposed action's facilities were taken into account. These projects are listed in Table 2-12.

Beyond these listed projects, it is conceivable that the approximately 120-MBD capacity that would become available in the Texaco pipeline once Shell discontinues using it, as well as the 40-MBD additional capacity in the proposed pipeline, could be used to transport crude oil to the Bay Area. The Texaco pipeline, with a maximum capacity of about 200 MBD, has the capability to deliver crude to four Contra Costa County refineries--Tosco in Avon, Shell in Martinez, and Exxon and Huntway in Benicia. The Texaco Trading and Transportion Company has indicated that while it has no contracts or plans for filling up the capacity that will be made available by the proposed action, it would try to find transporters to fill the capacity (Whitlock 1986). According to the Bay Area Air Quality Management District (BAAQMD), any available pipeline capacity to the Bay Area could be filled quickly, based on the number of permit applications they have received recently for shipping crude from the Bay Area to other refinery locations (Karas 1986).

Therefore, although the additional pipeline capacity made available by the proposed action could result in more oil being refined in Contra Costa County, it seems more likely that if this crude is delivered to the Bay Area, it might be sent by oil companies, via tanker, from the Bay Area to other refinery locations (Karas 1986). The BAAQMD now requires that any new tanker-loading proposal include provisions for vapor-controlled transfer of oil (from storage tank to oil tanker), which virtually eliminates emissions resulting from such projects (Karas 1986). Moreover, because all Bay Area refineries have BAAQMD permits specifying either their maximum oil throughput or their maximum emission allowances, any significant increase in a refinery's production would require notification of the BAAQMD.

Table 2-12

PROJECTS POTENTIALLY INTERRELATED WITH THE SAN JOAQUIN VALLEY PIPELINE

Project	Description/Location	Interrelationship
All-American Pipeline	A 30-inch, heated, 1,769-mile pipeline currently under construction between Las Flores on the California coast and Webster, Texas (near Houston), with a capacity of about 300 MBD.	Would compete for some of the crude oil that might otherwise be sent north via the Texaco pipeline after mid-1988. Potential interrelationship in tax benefits to government.
Pacific-Texas Pipeline	A 42-inch, unheated pipeline between Los Angeles and Midland, Texas, designed to receive and transport Alaskan North Slope crude (about 900 MBD). With sufficient dilutions, heavier crudes could also be sent through this pipeline. (Final EIR/EIS released in November 1985.)	Might compete for some of the crude oil that could otherwise be sent north via the Texaco pipeline after mid-1988. Potential interrelationship in tax benefits to government.
Southern California Pipeline System (SCPS) (Angeles leg)	A 30-inch, heated, 150-mile pipeline from Emidio in Kern County to Los Angeles refineries, with a capacity of about 330 MBD. It is a joint venture by Four Corners Pipeline Co. (a subsidiary of ARCO), Chevron, Texaco, and Shell, and is designed to transport offshore and San Joaquin Valley crude oil to Los Angeles. (Draft EIR/EIS expected in early 1987.)	Would compete for some of the crude oil that might otherwise be sent north to Bay Area refineries. Potential interrelationship in construction effects if schedules overlap (air quality, noise, socioeconomics, visual resources).
West Valley Pipeline	A feeder pipeline from San Joaquin Valley oil fields to Emidio, this is proposed as a means of transporting Kern County oil directly to Los Angeles via the Southern California Pipeline. In the proposal stages, this project would begin 7 miles north of Taft and run about 34 miles with an 80-MBD capacity. This project will depend on completion of the Angeles leg of the proposed SCPS pipeline.	Would compete for some of the crude oil that might otherwise be sent north to Bay Area refineries. Potential interrelationships in construction effects if schedules overlap (air quality, noise, socioeconomcis, visual resources). Interrelated effects on biological resources in Kern County.
Kern River, Mojave, or El Dorado Gas Pipelines	Various alternative interstate gas pipelines to Kern County oil producing areas, with the purpose of supplying gas for enhanced oil recovery (using gas to heat the steam used for oil recovery).	Potential interrelationships in construction effects if Kern County construction schedules overlap (air quality, noise, socioeconomics, visual resources). Would support the increased production of crude oil that could be sent north to Bay Area refineries.

Table 2-12 (Cont.)

Project	Description/Location	Interrelationship
Energy Production Projects		
Kern County 48.7-MW Biomass Plant	Construction of a 48.7-MW electric generating facility on a 123-acre parcel in Delano, Kern County. Fuel to consist of orchard and vineyard prunings, cotton stalks, and other agricultural wastes.	Potential interrelationship with regard to operational air pollutant emissions.
Lost Hills Cogeneration Plant	Construction of an 8.4-MW cogeneration plant on a 1-acre parcel in the South Belridge oil production field.	Same as above. Potential interrelationship with regard to visual resources once plant is built.
Gabriel 44-MW Biomass Plant	Construction of a 44-MW biomass-fueled electrical generation plant on 85 acres of industrial land near Mendota in Fresno County Plant will consume up to 300,000 dry tons/year of predominantly lumber waste and forest slash.	Potential interrelationship with regard to operational air pollutant emissions.
Mendota Biomass Power 25-MW Biomass Cogeneration Plant	A proposed 25-MW biomass-fired plant in Mendota on 40 acres of industrial land. Facility will burn about 260,000 dry tons/year of vegetative waste from local counties.	Same as above.
Stanislaus County Waste-to-Energy Project	A proposed 300,000 ton/year solid waste incineration facility near Patterson in Stanislaus County. The site would be close to I-5 near the Fink Road Landfill, and would produce electricity for sale to PG&E.	Same as above.
Corn Products Cogeneration Facility	Proposed construction and operation of a 50-MW coal-fired cogeneration plant adjacent to an existing corn processing mill; it is near the Stockton Metropolitan airport in San Joaquin County.	Same as above.
Richmond Energy Recovery Project	A proposed 330,000 ton/year municipal waste and sludge-burning plant in Richmond, Contra Costa County. The proposed volume of wastes to be processed has been increased from about 165,000 tons/year to the currently planned 330,000 tons/year.	Same as above.

Table 2-12 (Cont.)

Project	Description/Location	Interrelationship
Tosco Small Power Plant	A proposed 87.6-MW cogeneration facility to be fueled primarily by refinery gas in Martinez (Contra Costa County).	Same as above. Potential interrelationship with regard to visual resources at the northern terminus of the proposed pipeline.

For the purposes of the cumulative impact analysis, the possible indirect effects from the proposed action that are alluded to above are not included, for two reasons. In the first place, no new projects with the specific objective of refining or shipping the additional oil that could be sent to the Bay Area in 1988 have been proposed. And, because the oil industry is subject to substantial fluctuations in the extent and locations of oil supply and demand, it is not possible to predict the likelihood of such projects being proposed. Such decisions depend on economics and private sector marketing strategies, which are subject to sudden changes. Analyzing possibilities, as opposed to probabilities, is beyond the scope of cumulative impacts as outlined under CEQA definitions.

2.6 SIGNIFICANT IMPACT SUMMARY

Table 2-13 lists the principal features affected by the proposed project and identifies significant impacts and/or hazards. The classification is based on a mitigated action.

2.7 COMPARISON OF ENVIRONMENTAL IMPACTS

This section compares the significant impacts of the proposed project to the significant impacts of the alternatives, after mitigations have been applied to each. The differences between the proposed system and the alternatives in terms of environmental disadvantages and/or advantages are generally minor.

2.7.1 Alternative Routes

Combination Route

The Combination Route has the same impact as the proposed route since it traverses similar features. A minor point is that the alternative route follows I-5 more closely than the proposed route for almost 7 miles, and this is preferred from a land use viewpoint.

The proposed route would be fully restored and revegetated in this flat area and would be farmed, as the Combination Route would probably be, also. Along I-5, there is less likelihood that the pipeline would be impacted by agricultural activities or other equipment. No strong case can be made for the selection of either route over the other, since the distance involved is small. No residual significant adverse impact is associated with one but not the other.

Contra Loma Route

The Contra Loma Route crosses lower topography and fewer steep slopes than the proposed route and is preferred in terms of soils stability. However, the Contra Loma Route avoids only a small number of the steep slopes crossed by the proposed route, since it is so short. The Contra Loma Route would cross an estimated five slopes steeper than 18% and 11 steeper than 12%, whereas the proposed route would traverse 10 slopes steeper than 18% and 12 steeper than 12%. The difference is small, considering that the proposed route traverses

Table 2-13

PRINCIPAL ENVIRONMENTAL FEATURES AND SIGNIFICANT IMPACTS/HAZARDS FOR THE PROPOSED ACTION

Environmental Area	Action	Affected Features	Residual Hazard or Impact Significance After Mitigation: Significant	Residual Hazard or Impact Significance After Mitigation: Not Significant
Geology and Topography	Slope modification	Steep slopes, primarily in Contra Costa County		X
	Blasting	Occasional beds of hard rock of mainly Panoche Formation		X
	Preempting of commercial resources	Sand and gravel		X
Geological Hazards	Fault crossing	Concord Fault	X	
	Ground shaking	Mid station storage tank		X
	Subsidence	Booster station sites		X
	Landslides	Pipeline integrity		X
	Scour	Pipeline exposure		X
Soils	Revegetation failure related to erosion	Steep slopes or broken terrain, for a total of about 65 miles	X	
	Other soil limitations or sensitive soils	36 miles		X
Surface Water	Stream crossings, scour, sedimentation, turbidity, oil spill hazard	5 perennial streams 17 intermittent streams 231 unnamed, intermittent or ephemeral creeks		X
	Oil spill hazard to reservoirs and aqueducts or canals	Bethany Reservoir, Contra Loma Reservoir, California Aqueduct, Delta Mendota Canal	X	

Tsbla 2-13 (Cont.)

Environmental Area	Action	Affacted Feeturee	Raeidual Hazard or Impact Significance After Mitigation: Significant	Not Significant
Groundwatar	Oil pollution	Aquifer watar quality		X
	Water removal	Aquifer overdraft		X
Air Quality	Air quelity standards exceeded	Along right-of-way during construction		X
		At booster etetione		X
Socioeconomice	Value of project	Increase in tex basa		X
	Labor force housing and infraatructure require-mente	Limited short-term requiraments distributed ovar at leaet 20 communitiea		X
	Trevel to and from conetruction site, congestion, accidente	16 state highweye, 4 U.S. and Interstate highwsye; some crossed saverel times		X
Noiee	Conatruction-related noisa to 60 dB(A)	Noise-aensitiva recreetion and residentiel areaa		X
	Booater stations	Within 250 feet from eelected site		X
Land use and Recreation	Right-of-way and facilitiee	2,600 acrea during construction		X
		988 ecres during operation	X	
	Lend use conflicts	Proposed Coelinga Air Cargo Port in Freeno County, Betheny Reservoir Stete Recreation Araa in Alameda County, Black Diamond Mines Regionel Preserve, Stoneman Park and Proposed Reservoir, and proposed rasidentiel ereas, landfills, and Highway 4 improvements in Contra Costa		X[1]

Table 2-13 (Cont.)

Environmental Area	Action	Affected Features	Residual Hazard or Impact Significance After Mitigation	
			Significant	Not Significant
Land use and Recreation (Cont.)				
	Public land ownership	Federal: 6.9 miles State: 1 mile County: 1 mile Private: 249.4 miles		X
Visual Resources	Intrusions and contrast by right-of-way	No contrast after revegetation adjacent to existing corridors		X
	By booster stations and microwave towers	On sites already characterized by similar facilities or other developments		X
Paleontology	Heavy construction equipment	Direct damage to fossils on right-of-way		X
	Unauthorized collections	Already possible if fossils are present		X
Cultural Resources	Direct impact of construction	Ongoing survey for and protection of eligible sites		X
Terrestrial and Aquatic Resources	Establishment of weed species on right-of-way	Native habitat, countered by soil conservation and use of approved grass mixtures, keeping native planting stock viable and returning it to the trench area		X
	Long-term habitat reduction, loss of sensitive habitat	Vernal pool (milepost 227) oak trees (milepost 237, 238), sycamore trees at Orestimba Creek; minor avoidance by fine-tuning the route		X

Table 2-13 (Cont.)

Environmental Area	Action	Affected Features	Residual Hazard or Impact Significance After Mitigation: Significant	Residual Hazard or Impact Significance After Mitigation: Not Significant
Terrestrial and Aquatic Resources (Cont.)	Loss-term habitat reduction, loss of sensitive habitat (Cont.)	Freshwater wetlands; minor extent (0.3 acres) of saltwater marsh maintained by restoring present hydrology; saltbush scrub (177 acres) and alkali sink habitat (45 acres) and saltbush scrub habitat countered by leaving root systems in place.		X
	Special-status species losses	Raptors; endangered plants; endangered wildlife; kit fox dens (38) avoided my minor fine-tuning of the route in den areas.		X
	Aquatic habitat disturbance; reduction in population strength; oil spill into aquatic habitat	Wetland and vegetation and associated wildlife on Pacheco Creek; aquatic organisms of perennial streams. Pacheco Creek resources protected by block valves.		X
System Safety	System integrity	Natural gas leaks		
	Public and worker safety measures and state-of-the-art design, security systems	Oil and natural gas leaks, weed fires and other fires, and explosion effects on people and property.		X
Oil Spills	Seismic or direct impact or corrosion or defective pipe	Soil and surface water contamination, mortality of special status species, damage to biological communities	X[2]	

X[1] = Conflicts resolved at the local planning level are expected to have an insignificant residual conflict.

X[2] = Significance is a function of many factors, including size of spill and response action.

more than 50 slopes steeper than 18%, regardless of which route is selected. However, some of the steepest slopes (i.e., in excess of 35%) are avoided along the Contra Loma alternative.

Both routes cross the Concord Fault at Pacheco Creek; therefore, the risk of seismic hazards is the same.

The advantage that the Contra Loma Route has in avoiding the Black Diamond Mines Regional Park (1.4 acres) is offset by several land use conflicts unique to this route, including:

- The requirement for the removal of 10 to 30 homes in a residential area;
- Traversing Contra Loma Regional Park; and
- Proximity (500 feet) to the Contra Loma Reservoir.

The Contra Loma Route would, like the proposed route, affect competing land uses for residential, landfill, and Highway 4 improvements. Neither route is free of significant impacts.

2.7.2 Three New Booster Station Alternative

The booster station alternative, which would integrate three new booster stations (SJV-2, 3, and 4) instead of the two proposed stations (SJV-2b and 3b), does not have significantly different environmental impacts from the proposed project. This assumes landscaping at SJV-3b (mitigation measure [39]) to avoid an impact on the Westley Rest Stop Park. The most substantial difference between the alternative and the proposed project is the requirement for additional land (less than 25 acres).

2.7.3 Alternative Power Source Configurations

The alternative which proposes to use electricity to power the pumps and crude oil for the heaters has a significantly higher impact on air quality than either the proposed system (natural gas and cogeneration of heat) or the other alternative, which would rely on electricity and natural gas. The oil-burning alternative would result in SO_2 exceeding ambient standards by a factor of seven at SJV-3b.

2.7.4 Overhead Aqueduct Crossings

The environmental impacts of this alternative, which proposes to use suspension bridges to cross the canals and aqueducts, differ from those of the proposed action in regard to visual resources and potential spill impacts.

Visual resources (VRM Class 2 and 3) would be impacted in Kern, Kings, and Fresno counties. Any spill due to a break at the points of suspension into a canal or aqueduct, although unlikely, would directly impact substantial volumes of water until the system could be closed down. Because these aqueduct crossings would leave the pipeline exposed in six areas that would not be exposed in the proposed action, this alternative would create the possibility of above-ground damage causing spills into the aqueducts.

2.7.5 No-Action Alternative

The no-action alternative is not without environmental impacts, if it would mean the use of other modes of oil transportation than a pipeline to convey the crude to Martinez. If it would not mean the use of other modes of transportation, no-action would have none of the environmental impacts described in this report.

2.8 ENERGY EFFICIENCY/ENERGY CONSERVATION ANALYSIS

The energy efficiency and energy conservation analysis was based on data supplied by the applicant and on the energy analyses completed for several recent pipeline environmental impact documents.

Currently oil supplies 58%, and natural gas 32%, for a total of 90% of California's primary energy needs. The remaining 10% uses a variety of resources and is supplied almost entirely as electricity. The proposed action will have a negligible impact on energy consumption in the project area. The analysis indicates that the proposed action has been designed to avoid inefficient, wasteful, and unnecessary consumption of energy.

The proposed project will enable Shell to discontinue using an existing pipeline that is operating above its design capacity and is nearing the end of its economic life. With the increase in energy prices of the past decade, the trend has been toward design of more energy-efficient equipment, including pumps and heaters. For this reason, the proposed action will in all likelihood be more energy-efficient in its operation than the existing pipeline.

The alternatives for transporting oil by pipeline include truck, train, or tanker. The primary cost of transporting a barrel of oil results from the energy consumed during transportation rather than from capital expenditures. Therefore, a comparison of the costs of alternative transportation modes also serves as an order of magnitude comparison of energy consumption.

Truck transportation would require 600 trucks per day, with an average capacity of 200 barrels per truck, and would cost 4 to 5 times more than transportation by pipeline due to higher energy costs. Similarly, rail transportation would require 6 daily train sets of 72 cars each and would cost 2 to 3 times more than pipeline transportation. It is impossible to compare tanker transportation for the proposed project because it is not feasible to transport San Joaquin crude to Martinez by tanker, and the origin of other crude that might be transported to the refinery under exchange agreements would be purely speculative. However, several recent environmental impact documents (Celeron/All American, Pacific Texas) have concluded that transportation by tankers requires 1.5 to 2 times more energy than transportation by pipeline.

Construction

Energy consumption during construction is estimated at 2,000 gallons of gasoline, 2,800 gallons of diesel and 0.13 million KWh per mile of pipeline, based on recent pipeline EIR/S's. About 60% of the gasoline consumption results from workers traveling daily to and from the work site. An estimated 60% of all workers will travel to the construction site by bus, with 15% traveling by car and 25% by trucks used on the construction site (i.e., pick-up trucks). This energy conservation measure will significantly reduce total energy consumption during construction and will prevent waste of energy.

Operation

In addition to energy required to overcome changes in elevations, two major interrelated features of the proposed pipeline system require energy consumption: pumping the oil to overcome friction and heating the crude oil to reduce its viscosity thus enabling it to flow in the pipeline. Pumping and heating are interrelated, because for any given flow rate, pipe friction, and consequently the amount of pumping required to overcome it, can be reduced by increasing the pipe size and/or reducing the viscosity, within certain parameters, by additional heating. Table 2-11 compares horsepower (pumping) and heating requirements for various sizes of pipe, and demonstrates that for this project, pumping energy increases while heating energy decreases as pipeline diameter decreases.

As discussed in Section 2.2.3, alternative power sources exist for both pumping and heating. Two alternatives were considered in the analysis, uitilizing a combination of electric drive motors, crude oil-fired heaters, and natural-gas fired heaters to arrive at an optimal combination.

Energy consumption for the proposed action and the various combinations of alternative power sources and number of stations is provided in Table 2-14. For a given booster station and pipeline diameter configuration, Table 2-14 shows that the proposed power sources of natural gas turbines and utilization of exhaust heat are the most energy efficient for pipeline operations.

Typically about 90% of the energy required to boost pressure in a pipeline is consumed in overcoming friction; hence opportunities for reducing friction, thus conserving energy, are limited to those identified above. The primary opportunity for enhancing energy conservation is to reduce heating energy consumption. For the proposed project, this will be achieved by using waste heat from the gas turbines at 5 of the 7 stations, to heat the crude oil in the pipeline. Heat exchangers will be used to transfer waste heat from the gas turbine drivers to the pipeline oil. As shown, on Table 2-14, this conservation measure will significantly reduce the energy required to heat the oil in the pipeline.

Table 2-14

COMPARISON OF ENERGY CONSUMPTION OF PROPOSED AND ALTERNATE POWER SOURCE CONFIGURATIONS

Booster Station/ Pipeline Diameter Configurations	Proposed Power Source (Natural Gaa Turbine Drivers and Exhaust Heat)	Alternate 1 Power Source (Electric Motor Drivers and Crude-Oil-Fired Heaters)	Alternate 2 Power Source (Electric Motor Drivers and Natural-Gas-Fired Heaters)
Proposed: 2 new Booater Stations/ 24-inch-diameter Pipeline*	10,500 BHP 50 MM BTU/HR	10,500 BHP 105 MM BTU/HR	10,500 BHP 105 MM BTU/HR
Alternative: 3 new Booster Stationa/ 20-inch-diameter Pipeline*	15,300 BHP 45 MM BTU/HR	15,300 BHP 115 MM BTU/HR	15,300 BHP 115 MM BTU/HR
Alternative: 3 new Booater Stations/ 24-inch-diameter Pipeline*	9,800 BHP 65 MM BTU/HR	9,800 BHP 115 MM BTU/HR	9,800 BHP 115 MM BTU/HR

*Refer only to the diameter of the 173 miles comprising Segment 4.

Source: San Joaquin Valley Pipe Line Company.

A second possible conservation measure involves insulating the pipeline. Typically pipelines are designed to achieve the most cost effective means of transporting crude oil based on an economic balance between energy costs and the capital costs of insulation. The climate in the project area is temperate, and based on industry data, the minimum soil temperature will be about 53°F. The pipeline will be buried at a depth of 3 to 5 feet; because of the insulating properties of soil, this substantially reduces heat losses compared to bare pipes above ground. However, energy savings would be significant if insulation were used on this pipeline. Assuming an insulation thickness of 2 inches around the pipe, total heating requirements would be reduced from about 50 million BTU per hour to about 650,000 BTU per hour, a decrease of 98.7%. Power requirements for pumping would also be reduced, from a total of about 10,500 horsepower to about 6,500 horsepower, a decrease of 38.1%. Despite these energy savings, crude oil transportation costs would be about equal for an insulated buried versus uninsulated buried pipeline on this project, when the costs associated with installing insulation are factored in.

However, the design engineers believe that insulation has other disadvantages, such as the potential absorption of water in wet areas, thus causing its insulating capabilities to be lost, and have therefore decided against insulation.

The energy impact of routine maintenance of the pipeline system will be negligible since only a dozen personnel who are currently employed by Shell will be required.

Assuming the 24-inch diameter, 258-mile pipeline is constructed in one year, the energy consumption as a percentage of annual energy consumption of gasoline, diesel and electricity in the San Francisco Bay Area is as follows:

Gasoline	0.02%
Diesel	0.05%
Electricity	0.06%

3. AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This EIR/EIS analyzes the environment that the proposed project and its alternatives would affect. The area covered by this analysis varies, depending upon the nature of the resources affected by the proposed action. For example, for soils and surface water, the affected area would be the immediate area of disturbance, while for air quality and socioeconomics, a larger, more regional area is considered.

Each subsection lists the data sources used to prepare the various environmental descriptions and the regulatory framework for each environmental feature. Federal and state regulatory actions that pertain to the project as a whole are discussed in Section 1.3.

The environmental descriptions in this section identify sensitive environmental features. Impacts to these sensitive resources will depend on interaction with the project, resource values and sensitivities, and possible mitigation (as described in Sections 4 and 6). Not all of the features described will necessarily be impacted by the project. In general, resources which do not have the potential to be significantly affected by project construction and operation are not discussed in detail. However, certain environmental features which will not be significantly impacted are described to provide a complete description consistent with the requirements for the preparation of an EIR/EIS. To avoid repetition, sensitive environmental features which could be affected by development of the various alternatives to the proposed project are not discussed in detail if the same or similar resources could also be affected by the proposed project. Details on the environmental features for each of the counties are also presented in Appendix C, which also includes maps showing sensitive soil and land use features. These county-specific descriptions are summarized for each environmental feature in this section.

3.2 PROPOSED ROUTE

3.2.1 Geology and Topography

Data Sources

The data sources used to describe the geology and topography of the project area and to assess the potential for environmental impacts included USGS 7.5-minute quadrangle maps (scale 1:24,000); USGS professional papers; USGS open file reports; USGS water resources investigations reports; and USGS water supply papers. In addition, maps, bulletins, and special studies zone maps of the California Department of Natural Resources, Division of Mines, were consulted. The environmental impact report prepared by CH2M Hill for the Chemical Waste Management Kettleman Hills Facility in Kings County, California, was reviewed, and county public works departments were consulted. Specific references cited in the text are included in the bibliography (see Section 11).

Regulatory Setting

The use and protection of geological resources and features falls under the general federal and state regulatory requirements outlined in Section 1.3, particularly those of the BLM and SLC. In addition, local public works and planning departments require a variety of permits, which are identified in Table 1-1. These include grading permits, blasting permits, and seismic and geologic evaluations.

Environmental Setting

The majority of the proposed pipeline route is located within the western edge of the Central Valley of California. From the pipeline's southern terminus in western Kern County to its northern terminus in Martinez, Contra Costa County, the pipeline crosses the Great Valley and Coast Ranges geologic provinces.

The San Joaquin Valley is an elongated south-southeast/north-northwest trending basin that is bounded on the east by the Sierra Nevada and on the west by the Coastal Range. The basin terminates in the north at the delta of the San Joaquin and Sacramento rivers and in the south at the Tehachapi Mountains. The San Joaquin Valley includes the area between the foothills of the surrounding ranges and the area near the northern border of San Joaquin County. The geology of the counties in the affected region is described in Appendix C and is summarized in Table 3-1.

Historically, the area has been divided into three major geographic subareas: the Delta Basin, San Joaquin Basin, and Tulare Lake Basin. Geologic units within these three basins are generally divided into two types: consolidated sedimentary rocks, and unconsolidated or semi-consolidated deposits. This division is a direct reflection of the erosional and geomorphic events in the adjoining mountains.

Table 3-1

GEOLOGICAL FEATURES ALONG THE
PROPOSED SAN JOAQUIN PIPELINE BY COUNTY

County	Landform Features	Elevation (feet ASL*)	Topography	Predominant Formations	Dominant Rock Types	Potential Commercial Geologic Resources
Kern	Western border San Joaquin Valley (Midway Valley, McKittrick Valley, Antelope Plain, Lost Hills)	1,550-300 (Origin-Kern Co. Border)	Low, eroded hills and alluvial valleys	Tulare Formation and alluvium	Poorly consolidated sands and gravel, silt and clay	Sand and gravel oil and gas
Kings	Western border San Joaquin Valley, east of Kettleman Hills	225-580 (Kern Co. Border-MP 69)	Low relief, dissected alluvial fans	Recent sediment, gradational with Tulare Formation near Kettleman Hills; inter-fingered with older mudflow deposits in some areas	Moderately to poorly sorted gravels and sands, silt and clay	Sand and gravel
Fresno	Along eastern border of Kettleman Hills and Ciervo Hills and Cantua and Panoche Creek alluvial fans	450-1,140 (Los Gatos Creek - Laguna Seca Hills)	Alluvial fans and broad relief; steep slopes and valley of Laguna Seca Hills north of Little Panoche Creek	Alluvial and flood-plain deposits; Cretaceous sediments of the Laguna Seca Hills	Unconsolidated deposits, consolidated and semi-consolidated shale, mud, and sandstone	Sand and gravel
Merced	Laguna Seca Hills, O'Neill Forebay, and eastern foothills of Diablo Range	1,100-180 (Laguna Seca Hills-San Luis Creek [O'Neill Forebay])	Steeply dissected hills and valley alluvium	Upper Cretaceous Great Valley sequence, alluvium	Micaceous shale with sandstone and conglomerates	--

*Above sea level

Table 3-1 (Cont.)

County	Landform Features	Elevation (feet ASL*)	Topography	Predominant Formations	Dominant Rock Types	Potential Commercial Geologic Resources
Stanislaus	Eastern foothills	660-200 (Del Puerto Canyon-MP 186.5)	Steeply dissected hills and alluvial fans and terraces	Panocha Formation	Sandstone, shale, and conglomerate	--
				Los Banos Creek alluvium	Sand and gravel	Sand and gravel
				Tertiary	Shale, siltstone, and sandstone	--
				Cretaceous	Shale and siltstone	--
				Tulare Formation	Sand and gravel	--
San Joaquin	Alluvial fans and terraces	250-400 (MP 215-Alameda Co. Border)	Terraces and valley fills	Tulare Formation, alluvium	Sandstone and shale with tuff and conglomerate, also unconsolidated sediments	Sand and gravel
Alameda	Predominantly dissected foothills of Diablo Range	400-240 (San Joaquin Border-South Bay Pumping Plant)	Low eroded hills, alluvial fans, and terraces	Cretaceous and Tertiary	Sandstone and shale	--
Contra Costa	Alluvial fans and terraces, dissected hills on north end of Diablo Range, Sacramento Delta	570-0 (MP 251.5-Pacheco Creek)	Low relief alluvial fans and terraces, steep dissected hills and flat marshland	Tertiary, Cretaceous	Sandstone, shale, tuff, and conglomerate	--
				Recent alluvium and deltaic sediments	Unconsolidated sediments	Sand and gravel

*Above sea level

The geologic formations along the proposed route range from the Cretaceous and Tertiary sedimentary rocks of the Diablo Range to the Quaternary alluvial deposits of the San Joaquin Valley.

The consolidated rock units along the proposed route consist mainly of marine shale, sandstone, and mudstone, with some volcanic tuff encountered along the northern section of the route. Hard bedrock may be encountered in cemented beds of sandstone, shale, and conglomerates associated with the Panoche Formation. Areas along the proposed route which are likely to have near-surface bedrock are summarized in Table 3-2, while Table 3-3 indicates the geology for sites to be developed for the ancillary facilities.

The unconsolidated deposits overlying the consolidated rock are primarily gravel, sand, silt, and clay derived from the sedimentary rocks of the Diablo Range. The large alluvial fans at the base of the foothills consist of Quaternary colluvium and fluvial deposits from the foothills region. These gradually interfinger with the flood basin sediments on the valley floor.

Sand and gravel deposits of potential commercial value are encountered in each county.

3.2.2 Geological Hazards

Data Sources

The discussion on geological hazards in the project area is based on USGS professional papers and USGS open file reports; State of California special studies zone maps; and the seismic safety elements of various county planning departments. In addition, information on the occurrence of earthquakes in the region was obtained from the California Department of Natural Resources, Division of Mines and Geology. Other sources included several reports by Woodward-Clyde on the geology and geologic hazards of the project area as well as a report prepared by the Earthquake Engineering Research Institute on the 1983 Coalinga earthquake. In addition, the environmental impact report prepared by CH2M Hill for the Chemical Waste Management Kettleman Hills Facility in Kings County, California, was reviewed. For specific references cited in the text, see the bibliography (Section 11).

Regulatory Setting

While no regulatory actions pertain directly to geological hazards, county general plans include seismic safety elements which are considered in the local permit process and which stipulate building codes in zones affected by structural hazards including ground shaking and ground failure, faults, and seismic activity.

Environmental Setting

Potential geological hazards are primarily due to seismic activity, which includes ground shaking and the potential for ground ruptures along the surface traces of a fault. Secondary natural hazards

Table 3-2

LOCATIONS OF POTENTIALLY HARD LAYERS OF BEDROCK
ALONG THE PROPOSED ROUTE

County	Milepost	Formation (or age)	Anticipated Lithology
Fresno-Merced	137-139.7	Panoche	Sandstone, shale, conglomerate
Merced	140.5-143	Panoche	Sandstone, shale, conglomerate
Merced	144-146	Panoche	Sandstone, shale, conglomerate
Merced	150-152	Panoche	Sandstone, shale, conglomerate
Merced	153-159	Panoche	Sandstone, shale, conglomerate
Merced	166-168	Panoche	Sandstone, shale, conglomerate
Merced	169-170	Panoche	Sandstone, shale, conglomerate
Stanislaus	175-179	Paleocene	Sandstone, shale,
Stanislaus	186-190	Paleocene	Sandstone, shale,
Stanislaus	190-192.5	Panoche	Sandstone, shale, conglomerate
Stanislaus	192.5-196	Pliocene	Sandstone, shale, conglomerate
Alameda-Contra Coeta	217-226	Panoche	Sandstone, shale, conglomerate
Contra Costa	238.5-244	Eocene/Miocene	Sandstone, tuff, shale
Contra Costa	244-254	Miocene (Neroly)/ Pliocene	Sandstone, tuff, shale
Contra Costa	257.3-257.6	Panoche	Sandstone, shale

Source: Woodward-Clyde Consultants 1985.

Table 3-3

SURFACE GEOLOGY OF SITES PROPOSED FOR NEW ANCILLARY FACILITIES BY COUNTY*

County	Facilities	Geology
Kern	80-MBBL Storage Tank (Mid Station)	Alluvium
Fresno	SJV-2(b) Booster Station	Alluvial fan
Stanislaus	SJV-3(b) Booster Station	Alluvial fan
<u>Microwave Tower Repeater Stations</u>		
Fresno	Skunk Hollow (No. 6)	Sandstone/shale
Fresno	Panoche Junction (No. 7)	Alluvial fan
Fresno	SJV-2(b) Booster Station (No. 8)	Alluvial fan
Merced	Laguna Seca Ranch (No. 9)	Sandstone/shale/conglomerate
Merced	Cottonwood Hill (No. 10)	Sandstone/shale/conglomerate
Stanislaus	SJV-3(b) Booster Station (No. 11)	Alluvial fan
Stanislaus	Mount Oso (No. 12)	Franciscan metamorphics/igneous
Contra Costa	Mount Diablo (No. 13)	Franciscan metamorphics/igneous
Contra Costa	Martinez Refinery (No. 14)	Sandstone

*Does not include existing microwave towers at existing facilities.

result from the interaction of ground shaking with existing ground instabilities, which include subsidence, liquefaction, and settlement. The potential for slumping or dimensional instability is discussed in Section 3.2.3. Most of the hazard studies were conducted on the northern portion of the proposed route (Woodward-Clyde Consultants 1986). For this discussion, the northern portion of the project is considered to consist of Merced, Stanislaus, San Joaquin, Alameda, and Contra Costa counties. The southern portion of the project is considered to consist of Kern, Kings, and Fresno counties. Primary and secondary geological hazards are discussed below in terms of these northern and southern sections and are summarized in Table 4-1.

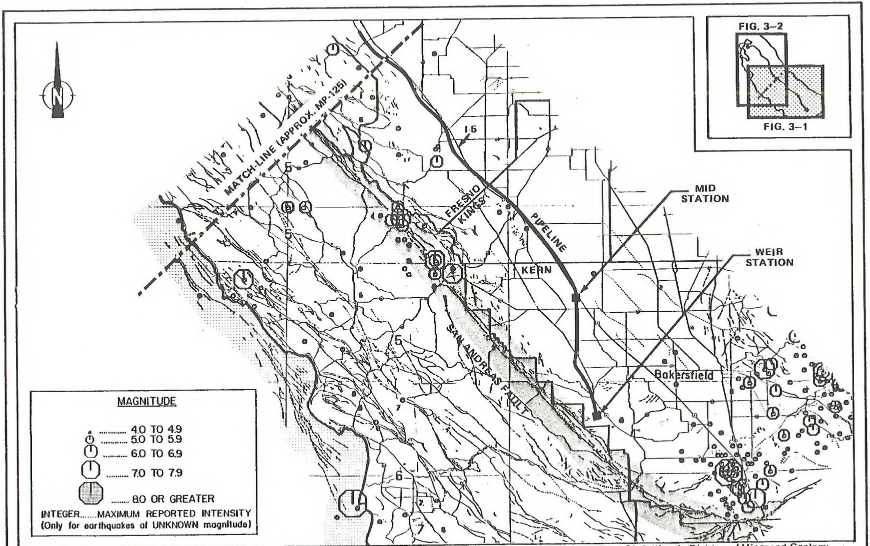
Primary Hazards. Although it is difficult to quantify the probability of surface fault ruptures in an area, the potential for ground failure in the southern portion of the proposed project is minor since the pipeline route does not cross any major fault systems within this area. Strong ground shaking poses a greater seismic threat than the possibility of a local ground rupture. Insignificant surface ruptures may be expected in areas of minor faulting, but this will probably be confined to areas adjacent to the faults (e.g., southwestern Kings County) (Seismic Safety Element 1974).

Figures 3-1 and 3-2 show trends of major mapped faults and the epicenters of the major earthquakes in California. No area of California is free from the possibility of major ground shaking (1978 Modified Mercalli Scale Intensity VII and greater).* Since 1810, at least six major earthquakes (>7 on the Richter scale) have occurred in California. These include: the January 9, 1857, earthquake near Fort Tejon; the March 26, 1872, earthquake near Lone Pine (Owens Valley); the San Francisco earthquake of April 18, 1906; an earthquake west of Point Arguello that occurred on November 4, 1927; the Imperial Valley earthquake of May 18, 1940; and the Arvin-Tehachapi (Bakersfield) earthquake of July 21, 1952. An earthquake at these magnitudes will produce ground shaking on a regional scale. The effects of such earthquakes depend not only on their magnitude, but their depth and the geological conditions at the surface.

The virtual certainty of a devastating magnitude 8.0 or larger earthquake in the next few decades along the San Andreas rift system is a matter of much concern in California. Statistically, it is most probable that the southern segment from about San Gorgonio Pass to Tejon Pass will be the site of the next massive earthquake. This interval of the fault has been locked with no appreciable lateral slip relief since the 1857 Fort Tejon earthquake. By comparison, the northern end of the fault was relieved in the 1906 San Francisco temblor: and the central segment from about Parksfield north to Hollister (the part of the San Andreas system closest to most of the pipeline route) has been yielding with creep and smaller shocks. Therefore, the next anticipated catastrophic earthquake on the San

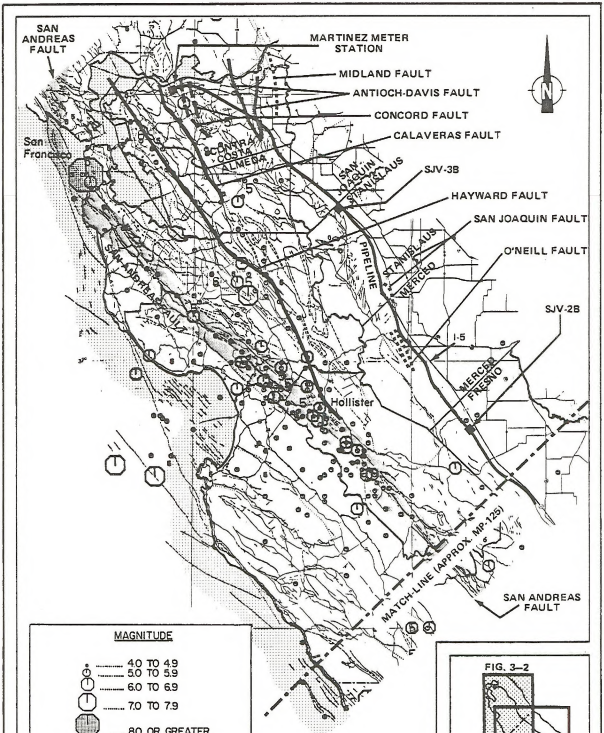
---

*The Modified Mercalli Intensity (MMI) measures the intensity of an earthquake in terms of the damage it causes to structures, while the Richter scale measures the energy released by the earthquake.



Source: Earthquake Epicenter Map of California by Charles R. Real, Tousson R. Toppozada, and David L. Parke 1978 Map Sheet 39 California Division of Mines and Geology.

Figure 3–1 EPICENTERS OF MAJOR EARTHQUAKES AND PRINCIPAL FAULTS ALONG THE SAN JOAQUIN VALLEY PIPELINE ROUTE: MILEPOST 0-125



Source: Earthquake Epicenter Map of California by Charles R. Real, Tousson R. Toppozada, and David L. Parke 1978 Map Sheet 39 California Division of Mines and Geology.

Figure 3–2 EPICENTERS OF MAJOR EARTHQUAKES AND PRINCIPAL FAULTS ALONG THE SAN JOAQUIN VALLEY PIPELINE ROUTE: MILEPOST 125-258

Andreas will probably be well to the south of the pipeline route. It is, of course, not possible to predict the size or location of future earthquakes.

The southern portion of the pipeline is within 40 miles of the Arvin-Tehachapi epicenter along the White Wolf Fault, but no major damage was reported as the result of this earthquake in the immediate area of the proposed project. Major damage is here considered to be rupture of the pipeline or of oil tank facilities. No such damage was reported in the Taft-Elk Hills area in the wake of the 1952 Tehachapi shock. Modified Mercalli Intensity (MMI) cannot have exceeded VI (see San Joaquin County General Plan, Seismic Safety Element). The pipeline route roughly parallels the San Andreas Fault, and a major earthquake along a segment lying within 25 to 30 miles of the pipeline could potentially break the pipe. More likely is the occurrence of a moderate earthquake, of the magnitude of the Coalinga earthquake of 1983. This earthquake took place in an area with little historic seismicity and no known active faults. The epicenter was about 6 miles northeast of Coalinga under Anticline Ridge, only about 3 miles from the Caliola station and the proposed pipeline route. In Coalinga, the MMI was estimated at VIII and some minor liquefaction of alluvium was recorded (not severe enough to cause visible surface disturbance). There are several oil fields in the area, including the East Coalinga Field, directly over the epicenter.

In regard to the Coalinga earthquake, the California Department of Natural Resources, Division of Mines and Geology (Special Publication No. 66), noted that:

> Pipelines fared rather well during the earthquake sequence. Although there were quite a number of leaks, most were small in nature and easily repaired. Apparently all the leaks were confined to coupling joints and connections. There were no reports of lines breaking other than at a connection.

The Coalinga earthquake was 6.7 on the Richter scale in an area previously only known for a maximum 4 to 5 magnitude earthquake. Although this was close to being a major earthquake, it seems very likely that the MMI along the proposed pipeline route did not exceed VIII. Mr. A. Steele, a geologist with the Fresno County Public Works and Development Services, noted that there was no visible surface disruption or signs of ground disturbance in the immediate area of the proposed project from the Coalinga earthquake (personal communication, May 7, 1986), although some damage was reported for bridges and a concrete block structure which was not reinforced.

In the northern portion of the proposed project, extending from Merced County to the pipeline's terminus, the potential for ground shaking increases as the route approaches a number of active faults. These include the Calaveras Fault, the Midland and Antioch-Davis faults, the Hayward Fault, the San Andreas Fault, and the Green Valley (Concord) Fault. All of these faults have a maximum credible earthquake potential of 7 or greater on the Richter scale, with the possibility of producing an MMI of VIII along the pipeline route. The California Division of Mines and Geology has designated the entire distance as a moderate severity zone for earthquake intensity with a maximum probable MMI of VII or VIII (Bulletin No. 198). The Division of Mines and Geology has also indicated that, from 1810 to 1971, in Merced, Stanislaus, and San Joaquin counties, six to 10 episodes of ground shaking with intensities of VI, VII, or VIII occurred along the proposed route. In Alameda and Contra Costa counties, 11 to 15 such episodes occurred, also ranging in intensity from MMI VI to VIII. Specific hazards due to ground rupture at fault crossings are discussed below.

In the northern portion of the proposed project, the pipeline crosses four major faults: the O'Neill Fault System, the San Joaquin Fault, the Antioch-Davis Fault, and the Concord Fault. The proposed route crosses the O'Neill Fault System close to mileposts 148, 152, and 161. According to Lettis (1982, 1985), the O'Neill Fault is a bedding plane fault; vertical displacement of the foothill pediment surfaces ranged from 100 meters to less than 5 meters. Lettis also concluded that the O'Neill Fault did not displace alluvial deposits with ages of 40,000 to 60,000 years, and deduced that any large fault activity in this region occurred before deposition of alluvial sediment. Therefore, this fault is deemed inactive.

The proposed route crosses a branch of the San Joaquin Fault at approximately milepost 173.2. Lettis (1982) found that this predominately east-facing, faceted, linear escarpment had an average rate of displacement (while active) of 47 to 65 centimeters per year. His findings depicted the fault as overlain by unfaulted, pre-Holocene (40,000 to 60,000 years old) alluvial sediment. Lack of recent seismicity along this fault supports his conclusion that there has been negligible activity in the past 40,000 to 60,000 years. Shedlock and others (1980) estimate a potential for an earthquake in the magnitude range of 5 to 7.

The proposed route traverses an inferred southern extension of the Antioch Fault at about milepost 236.6. This area is referred to as the Antioch-Davis Fault, and is a southern part of the Davis Fault. According to Burke and Helley (1973), the Antioch Fault exhibits evidence of surface fault creep in the City of Antioch which may be attributed to an earthquake swarm that occurred in 1965. Wesson and others (1975) estimate that a maximum credible earthquake on the Antioch Fault would have a magnitude of 6.6 and might be accompanied by a surface rupture of 13.5 inches (Slemmons 1977).

Around milepost 256.7, the proposed route crosses the trace of the Concord Fault, which is believed to be a northern extension of the Calaveras Fault, a major branch of the San Andreas Fault. The main trace of the Concord Fault is located beneath the channel of Pacheco Creek, where, according to the Contra Costa County Seismic Safety Element (Contra Costa County 1975), it is responsible for shearing pilings and deforming the main span of the Santa Fe Railroad bridge. This bridge was constructed in 1975 and is located just south of the pipeline. Slemmons and Chung (1982) suggest that a maximum earthquake on the Calaveras Fault would probably be in the range of 6.75 to 7.25, which would yield a displacement of about 2.5 feet (Slemmons 1977, Table II). This would constitute the largest hazard within the pipeline system.

Secondary Hazards. The evaluation of seismic-related geologic hazards, such as subsidence, liquefaction, and settlement, is based on analysis of maps and reports, as well as aerial photographs. The potential for active settlement in the southern portion of the proposed project is considered minimal, except in northern Kings County/ southern Fresno County, where the pipeline route is aligned close to the highlands. This area could undergo extensive settlement through subsidence, which is a general lowering of the ground surface over a large area caused by either seismic activity or the addition of large quantities of water (e.g., from flood or rainfall). The potential for subsidence in this area is great due to the deep water table and the poorly consolidated soils (e.g., in the western San Joaquin Valley).

The northern portion of the proposed project is believed to have the greatest potential for liquefaction. This is a phenomenon in which saturated, cohesionless soils temporarily lose their strength and liquefy when subjected to dynamic forces such as intense and prolonged ground shaking. This occurs when the water table is less than 50 feet below ground surface and the soils are predominantly unconsolidated. The potential for liquefaction increases as the groundwater approaches the surface.

Whether or not soils will liquefy depends on the amplitude and frequency of the wave motion of the ground shaking and its duration. The less consolidated the soil, the shorter the duration and the less intensity of shaking is needed to cause liquefaction. More compacted and consolidated soils will withstand longer durations of shaking before liquefaction occurs. The type of earthquake expected for the northern portion of the proposed project is a long rolling type of motion (Seismic Safety Element 1978). The primary risk for liquefaction would probably be in the vicinity of the Concord Fault in Contra Costa County where delta sediments of low cohesive strength are saturated at very shallow depths. Other areas of lower risk are saturated alluvium in creek crossings and the possible areas of shallow seasonal perched water tables in Kern County immediately adjacent to Mid station.

3.2.3 Soils

Data Sources

USDA Soil Conservation Service (SCS) field offices in areas affected by the proposed project were contacted and soil survey information obtained for the major soil units traversed by the proposed pipeline. In addition, the University of California at Davis, Department of Land, Air and Water Resources, was consulted. Selected streams were field checked. The California Department of Transportation was also consulted regarding the potential for soils with shrink-swell characteristics along the route.

Regulatory Setting

No particular regulations directly apply to soils and particularly not to soils on private lands. However, soil resources and soil limitations, such as site and slope conditions and water tables, are indirectly considered in the regulatory process by BLM, USFWS, and CDFG in regard to revegetation; by the California Food and Agriculture Department in regard to productivity; and at the county permit level in regard to certain building codes. The USDA SCS is involved through NEPA's overall review process.

Environmental Setting

A county-specific description of soils and soil conditions encountered by the proposed pipeline, as well as soil feature maps, are given in Appendix C, which also includes maps showing the locations of sensitive soils features. Tables 3-4 through 3-11 summarize the major soil units crossed by the proposed pipeline route in each county. The tables indicate the characteristic terrain, percent slope range, depth, texture, and drainage class for each of the major soil units. The factors which are most significant from a pipeline construction and restoration standpoint include slope and erosion potential, depth to consolidated material, drainage, potential for slumping or dimensional instability, shrink-swell, and corrosivity. Descriptions of varying degrees of erosion hazard are based on lands which have bare soil conditions, or have been disturbed, or otherwise are not under soil conservation practices. Soil associations encountered at booster stations and other ancillary facilities are identified in Table 3-12.

An overview of Tables 3-4 to 3-11 indicates the presence of numerous soil units which have specific soil characteristics. A discussion of a broader summary classification of these units has very little use, since they range from valley floor and alluvial fan soils to the soils of steep uplands which are highly erosive, including numerous units having intermediate characteristics. These soils are generally derived from the same parent materials transported downward and deposited at lower, more level positions as basin rim soils and terrace soils and alluvial fans. These soils tend to be deep and they may have slow permeability and a high shrink-swell potential, depending on the clay content; in addition, they tend to be corrosive and alkaline or saline. In relation to slopes, a moderate- to high-degree of erodibility is their main characteristic relevant to a pipeline project. This includes the instability of deep clays or clay-loams on steep side slopes and a potential to slump or slide down from these topographical positions in certain areas.

3.2.4 Surface Water

Data Sources

The data base used to describe surface water resources in the project area and to determine impact significance was obtained from various sources. Initial watercourse determination and basin

Table 3-4

MAJOR SOILS UNITS ENCOUNTERED BY THE PROPOSED ROUTE IN KERN COUNTY

Soils Unit	Terrain	Approximate Distance Along Proposed Route (miles)	Percent Slope Encountered	Depth*	Texture	Drainage Class	Limiting Factors
Hillbrick-Kilmer-Mendi	Hilltops and ridges	2.3	10-55	Shallow to deep	Sandy loam	Well drained	Steep slopes and high erosion hazard; highly corrosive to uncoated steel
Elkhills	Lower hills and terraces	7.2	9-50	Very deep	Sandy loam	Well drained	Steep slopes and moderate to high erosion hazard; highly corrosive to uncoated steel
Panoche-Millham-Kimberlina	Alluvial fans, plains, and terraces	12.4	1-3	Very deep	Clay loams, sandy loams, and fine sandy loams	Well drained	Highly corrosive to uncoated steel
Kimberlina	Recent alluvial fans and plains	13.4	1-9	Very deep	Fine sandy loam	Well drained	Slight erosion hazard on slopes greater than 2 %; highly corrosive to uncoated steel
Nahrub-Lethent Twisselman	San Joaquin Valley floor	8.3	0-2	Very deep	Clays and silt loams	Well to somewhat poorly drained	Moderate to strongly saline alkali; slow to very slow permeabilities; high shrink-swell potential; highly corrosive to concrete and uncoated steel
Garcea-Panoche	Alluvial fans on basin rims	1.1	0-2	Very deep	Silt loams and clay loams	Well drained	Saline-alkalinity; very slow permeabilities; moderate shrink-swell potential for subsoil; highly corrosive to uncoated steel

*Shallow = 10 to 20 inches
Deep = 40 to 60 inches
Very deep = >60 inches

Source: Unpublished Soil Survey drafts, summaries, personal communications, USDA-Soil Conservation Service, Area Office, Fresno, California, 1986.

Table 3-5

MAJOR SOILS UNITS ENCOUNTERED BY THE PROPOSED ROUTE IN KINGS COUNTY

Soils Unit	Terrain	Approximate Distance Along Proposed Route (miles)	Percent Slopes Encountered	Depth*	Texture	Drainage Class	Limiting Factors
Kettleman-Cantua-Mercey	Kettleman Hills	10.0	10-30	Moderately deep to deep	Loam and sandy loam	Well to excessively drained	Moderate to high erosion hazard; moderate to highly corrosive to uncoated steel. Moderate shrink-swell potential in some areas.
Wasco-Panoche-Westhaven	Alluvial fans and plains (San Joaquin Valley)	13.7	0-5	Very deep	Loam and sandy loam	Moderately well drained	Slight erosion hazard on sandy loams; highly corrosive to uncoated steel; moderate shrink-swell potential in some subsoils.
Lethent-Garces-Panoche	Alluvial fans and basin rims	3.8	0-1	Very deep	Sandy loam and clay loam	Well to moderately well drained	Saline-alkali; very highly corrosive to uncoated steel; moderate to high corrosivity to concrete; moderate to high shrink-swell potential in subsoils.

*Moderately deep = 20 to 40 inches
Deep = 40 to 60 inches
Very deep = >60 inches

Source: Unpublished Soil Survey drafts, summaries, personal communications, USDA-Soil Conservation Service, Area Office, Fresno, California, 1986.

Table 3-6

MAJOR SOILS UNITS ENCOUNTERED BY THE PROPOSED ROUTE IN FRESNO COUNTY*

Soils Unit or Location	Terrain	Approximate Distance Along Proposed Route (miles)	Percent Slope Encountered	Depth**	Texture	Drainage Class	Limiting Factors
Blue Hills Tumey Hills Panoche Hills	Steep slopes, lower hills	5.0 1.0 2.5	15-65 10-50 10-50	Probably shallow to moderately deep	Probably loams, clay loams, and sandy loams	Well drained, probably somewhat excessively in some areas	Moderate to very high erosion hazard; other limitations unknown; highly corrosive to uncoated steel
Ciervo Hills	Moderately steep foothills	10.0	10-30	Probably moderately deep to deep	Probably loams, clay loams, and sandy loams	Probably well drained	Moderate to possibly high erosion hazard; highly corrosive to uncoated steel
Unnamed	Terraces	15.5	1-15	Deep, and possibly very deep	Clay loams, possibly loams, and sandy loams	Probably well drained	Possibly slow permeabilities; slight to moderate erosion hazard on steeper slopes; highly corrosive to uncoated steel; high shrink-swell potential
Unnamed	Alluvial fans	26.0	0-5	Deep to very deep	Loams, clay loams, sandy clay loams, clay	Probably moderately well to well drained	Possible slow permeabilities in more clayey soils; highly corrosive to uncoated steel; high shrink-swell potential

*Soils in western Fresno County have not been surveyed or mapped. Depth, texture, drainage class, and limiting factors are based on analysis of terrain encountered along the route in Fresno County and correlations made, based on similar geology, terrain, and known soils encountered in adjoining Merced and Kings counties. USDA-SCS Fresno Area Office soil scientist indicates all soils encountered by the proposed route in Fresno County most likely present a high corrosivity hazard to uncoated steel.

**Shallow = 10 to 20 inches
Moderately deep = 20 to 40 inches
Deep = 40 to 60 inches
Very deep = >60 inches

Source: Unpublished soil survey drafts, summaries, personal communications, USDA-Soil Conservation Service, Area Office, Fresno, California, 1986.

Table 3-7

MAJOR SOILS UNITS ENCOUNTERED BY THE PROPOSED ROUTE IN MERCED COUNTY

Soils Unit	Terrain	Approximate Distance Along Proposed Route (miles)	Percent Slope Encountered	Depth*	Texture	Drainage Class	Limiting Factors
Arburua-Wisflat	Foothills	8.8	10-65	Shallow to moderately deep	Calcareous loams and clay loams	Well drained	Slope, moderate to high erosion hazard; highly corrosive to uncoated steel
Oneil-Apollo	Foothills	10.4	10-100	Moderately deep to deep	Calcareous silt loams and clay loams	Well drained	Erosion, slope, excess lime content in some areas; moderate to high corrosivity for uncoated steel
Damluis-Bapoa-Los Banos	Terraces	11.7	1-15	Very deep	Calcareous clay loams and clay loams	Well drained	Excess lime content in some areas, slow permeability; slope; moderate to high shrink-swell potential; highly corrosive to uncoated steel
Woo-Stanislaus	Alluvial fans	8.8	0-5	Very deep	Loam, clay loam, sandy clay loam, clay	Well drained	Slow permeability in clayey soils; high shrink-swell potential for some areas; highly corrosive to uncoated steel

*Shallow = 10 to 20 inches
Moderately deep = 20 to 40 inches
Deep = 40 to 60 inches
Very deep = >60 inches

Source: Unpublished soil survey drafts, summaries, personal communications, USDA-Soil Conservation Service, Area Office, Fresno, California, 1986.

Table 3-8

MAJOR SOILS UNITS ENCOUNTERED BY THE PROPOSED ROUTE IN STANISLAUS COUNTY*

Soils Unit	Terrain	Approximate Distance Along Proposed Route (miles)	Percent Slope Encountered	Depth**	Texture	Drainage Class	Limiting Factors
East Side Diablo Range	Foothills	15.0	9-60	Moderately deep to deep	Calcareous loams and clay loams	Well drained	Slope, moderate to high erosion hazard; moderate to high shrink-swell potential; highly corrosive to uncoated steel
Unnamed	High terraces	7.0	1-20	Deep to very deep	Loams and clay loams and clays	Well drained	Slow permeabilities, slight to moderate erosion hazard in some areas, runoff; moderate to high shrink-swell potential; highly corrosive to uncoated steel
Unnamed	Lower terraces	3.0	1-10	Deep to very deep	Loams and clay loams and clays	Well drained	Slow permeabilities, slight and occasionally moderate erosion hazard; moderate to high shrink-swell potential; highly corrosive to uncoated steel
Vernalis-Salado	Recent alluvial fans	1.0	0-2	Very deep	Loams, fine sandy loams, clay loams, and clays	Well drained	Moderate to high shrink-swell potential; highly corrosive to uncoated steel
Myers-Stomer	Recent alluvial fans	0.4	0-2	Very deep	Sandy clays and silty clays	Well drained	Slow permeability; moderate to high shrink-swell potential; highly corrosive to uncoated steel
Zacharias-Positas	Older alluvial fans	0.8	0-9	Moderately deep to very deep	Gravelly loams and clay loams	Well drained	Slight erosion hazard in some areas; moderate to high shrink-swell potential; highly corrosive to uncoated steel

*Foothill and terrace soil areas in western Stanislaus County have not been surveyed or mapped. Information for depth, texture, drainage class, and limiting factors is based on analysis of terrain encountered along the proposed route in Stanislaus County, and correlations made, based on similar geology, terrain, and known soils encountered in adjoining areas of Merced and San Joaquin counties.

**Moderately deep = 20 to 40 inches
Deep = 40 to 60 inches
Very deep = >60 inches

Source: Soils of West Side Stanislaus Area California, University of California at Davis and County of Stanislaus, California, April 1968.

Table 3-9

MAJOR SOILS UNITS ENCOUNTERED BY THE PROPOSED ROUTE IN SAN JOAQUIN COUNTY

Soils Unit	Terrain	Approximate Distance Along Proposed Route (miles)	Percent Slope Encountered	Depth*	Texture	Drainage Class	Limiting Factors
Cheque-Cerbone	Rolling and hilly dissected terraces	11.25	2-40	Very deep	Clay loam, clay, loam, gravelly clay loam	Well drained	Moderate to high shrink-swell potential in surface and subsoils; slow permeabilities; high corrosivity to uncoated steel; high erosion hazard on disturbed steeper areas
Zacharias	Low terraces and alluvial fans	2.0	0-8	Very deep	Clay loam, gravelly clay loam	Well drained	Moderate shrink-swell potential in some subsoils; moderately slow permeabilities in some subsoils; highly corrosive to uncoated steel; moderate erosion hazard on disturbed steeper slopes
Stomer	Nearly level alluvial fans	1.75	0-2	very deep	Clay loam, clay	Well drained	Moderate shrink-swell potential in surface high shrink-swell potential in subsurface; erodes easily on disturbed slopes greater than 3%

*Very deep = >60 inches

Source: USDA-Soil Conservation Service, Stockton Soil Survey Office, Stockton, California, Unpublished soil survey drafts, personal communications, July 1986.

Table 3-10

MAJOR SOILS UNITS ENCOUNTERED BY THE PROPOSED ROUTE IN ALAMEDA COUNTY

Soils Unit	Terrain	Approximate Distance Along Proposed Route (miles)	Percent Slope Encountered	Depth*	Texture	Drainage Class	Limiting Factors
Linne	Upland hills	3.2	9-30	Shallow to moderately deep	Mostly calcareous clay loam	Well drained	Moderate to high erosion hazard; moderate shrink-swell potential; highly corrosive to uncoated steel; potential for piping
Altamont	Upland hills	3.2	9-30	Shallow to deep	Clays and clay loams	Well drained	Moderate erosion hazard; highly corrosive to uncoated steel; potential for slumping on side slopes greater than 15%; potential for piping

*Shallow = 10 to 20 inches
Moderately deep = 20 to 40 inches
Deep = 40 to 60 inches

Source: USDA-Soil Conservation Service, Field Office, Livermore, and Area Office, Santa Rosa, California; personal communications, May 1986.

Table 3-11

MAJOR SOILS UNITS ENCOUNTERED BY THE PROPOSED ROUTE IN CONTRA COSTA COUNTY

Soils Unit	Terrain	Approximate Distance Along Proposed Route (miles)	Percent Slope Encountered	Depth*	Texture	Drainage Class	Limiting Factors
Altamont-Diablo-Fontana	Steep uplands	23.8	9-75	Shallow to deep	Clays and silty clay loams	Well drained	Moderate to high erosion hazard; moderate to high shrink-swell potential; highly corrosive to uncoated steel; susceptible to slumping and piping
Brentwood-Rincon-Zamora	Valley fill, alluvial fans, low terraces	2.0	0-5	Very deep	Clay loams and silty clay loams	Well drained	Moderate to high shrink-swell potential; moderate to highly corrosive to uncoated steel
Capay-Sycamore-Brentwood	Valley fill and floodplains	0.7	0-5	Very deep	Silty clay loams and clay loams	Well drained	Moderate to high shrink-swell potential; highly corrosive to uncoated steel
Capay-Rincon	Valley fill	2.0	0-5	Very deep	Clays and clay loams	Moderately and well drained	Slight erosion hazard in some areas; moderate to high shrink-swell potential; moderate to highly corrosive to uncoated steel
Clear Lake-Cropley	Valley fill, coastal valley basin	2.5	0-5	Very deep	Clays	Poorly to moderately well drained	Moderate salinity in some areas; high to very high corrosivity to uncoated steel; high shrink-swell potential; slow permeabilities; ponding water
Marcuse-Solano-Pescadero	Basin rims	1.25	0-2	Very deep	Clays, loams, and clay loams	Very poorly to somewhat poorly drained	Moderate to strong salinity; very highly corrosive to uncoated steel; moderate to high shrink-swell potential; slow permeability; ponding water

*Shallow = 10 to 20 inches
Deep = 40 to 60 inches
Very deep = 60 inches

Source: Soil Survey of Contra Costa, California, USDA-Soil Conservation Service and University of California, 1977.

Table 3-12

SOIL ASSOCIATIONS AT BOOSTER STATIONS
AND MICROWAVE FACILITIES, BY COUNTY

County	Facility	Soil Unit*
Kern	MW Station 1	Elk Hills Association
	McKittrick Station	Elk Hills Asaociation
	Kernridge Station and MW Station 2	Panoche-Milham-Kimberlina
	Mid Station and MW Station 3	Nahrub-Lethent-Twisselman
King	Kettleman Station and MW Station 4	Kettleman-Cantua-Mercey
Fresno	Caliola Station and MW Station 5	Unnamed alluvial fan soils
	MW Station 6	Unnamed terrace soils
	SJV-2(b) and MW Station 8	Unnamed alluvial fan soil
Merced	MW Station 9	Arburua-Wisflat
	MW Station 10	O'Neill-Apollo
Stanislaus	SJV-3(b) and MW Station 11	Myers-Stomar
	MW Station 12 and MW Station 13	Unnamed soils of the east side Diablo Range
Contra Coata	MW Station 13	Rock outcrop/Xerothents**

Note: MW Station = Microwave station

*See Tables 3-4 through 3-11 for soil characteristics.

**Shallow (0-20 inches). These soils consist of 50-70% rock out-crop; slopes 30-75%; excessive drainage; high erosion hazard. Shrink-swell potential is low; corrosivity is low.

characterization were based on an examination of USGS contour maps, both 7.5-minute and 1:250,000 scale. Flow regime and water quality conditions of the streams crossed by the proposed pipeline were determined based on EPA (Region IX) STORET data and USGS water resource data. Verification of the locations and characteristics of surface water bodies was provided by an aerial overflight of the proposed route. Additional information was sought from county public works and planning departments. From these sources, and the Federal Emergency Management Agency (FEMA), flood hazards were identified. Other additional data sources in the published literature which were reviewed and which are cited in the text are included in the bibliography (see Section 11).

Regulatory Setting

Pipeline stream crossings require a permit from the U.S. Army Corps of Engineers (COE) Sacramento and San Francisco Districts for all streams with an average annual flow rate greater than 5 cubic feet per second (cfs). The COE administers the stream crossings under the Nationwide 404 permit and Section 10 permit process.

Hydrostatic testing will require the withdrawal of test water and the discharge of wastewater. The discharge of hydrostatic test water may require a permit from EPA Region IX (San Francisco) under the National Pollutant Discharge Elimination System (NPDES) permit program. The Regional Boards of the State Water Resource Control Board (SWRCB) require an NPDES permit if the discharge is into surface water. If the discharge point is to a dry watercourse or a dry lake bed, a Report of Waste Discharge is required. This report is not required, however, if the water is not contaminated, if it lacks the potential to contaminate groundwater, or if the method of discharge avoids erosion and soil disturbance.

The diversion and withdrawal of surface waters for testing may require a temporary permit from the Division of Water Rights of the SWRCB. Such a permit may not be necessary if the water is purchased or if the water is returned for discharge to the point (or drainage area) of withdrawal.

The aqueduct crossings and encroachment upon the California Aqueduct will require a permit from the California Department of Water Resources and from the U.S. Bureau of Reclamation in the case of the Delta Mendota Canal. The proposed pipeline crosses the California Aqueduct four times.

The California Department of Fish and Game (CDFG) will enter into Stream Alteration Agreements with SJVPLC to stipulate stream crossing procedures. Such agreements are necessary for each stream crossing involving trenching within the mean high water mark and alterations to the natural features of these streams.

Permits for water use at booster stations will be required from local water districts upon review by the U.S. Bureau of Reclamation and the SWRCB. In addition, flood control permits, drainage permits, and permits to cross canals may be required from county or municipal public works departments and water agencies.

Environmental Setting

The proposed pipeline route generally follows the western edge of the San Joaquin Valley. Along its course it spans the foot-hills of three major surface water basins: the Tulare Lake Basin in the south, the San Joaquin Basin in the Central Valley area, and the San Francisco Bay Basin in the north. Surface water quality along the proposed route is characterized by high dissolved solids, sulfate, and varying mineral and carbonate hardness (USGS 1984).

The natural drainage patterns in all three basins have been modified by control structures, diversion structures, agricultural operations, irrigation facilities, and transportation corridor embankments. These diversion techniques provide water for agriculture, which accounts for more than 95% of the valley's water use (USGS 1984). Surface water accounts for about 60% of the annual water supply to the San Joaquin Valley. This surface water supply is made up of an estimated two-thirds natural runoff and one-third imported water. The imported water and related transport system play an important role in the valley's water supplies. This supplemental water balances the deficiency resulting from the lack of sufficient rainfall during the year to meet use demands. In addition, these waters maintain wildlife habitat.

The climate of the San Joaquin Valley is arid; it is characterized by hot summers and cool winters, and has a rainy season that usually extends from October to April. During this period, the mean annual precipitation in the valley ranges from 20 inches in the north to 5 inches in the south (U.S. Department of Commerce 1983). However, this amount of precipitation does not meet the water demands placed on the valley's water resources, creating a 20- to 4-inch average annual groundwater basin deficiency (Todd 1983).

Due to the alignment of the proposed route along the western edge of the valley, the pipeline crosses the westernmost drainages of these basins. Within these basins, the proposed pipeline crosses over 225 intermittent and ephemeral streams whose flow is directly correlated to the precipitation noted above. Many of these streams are dry during most of the year. They flow only during high runoff when channels are formed. However, the USGS topographical maps (1:24,000) which formed the basis for the stream classification do not permit making a distinction between intermittent streams and ephemeral streams. The proposed route also crosses several canals and perennial streams. For all streams combined, the total acreage of streambed directly affected by construction is 10 acres. Table 3-13 lists the surface waters crossed by the proposed pipeline. A detailed, county-by-county description of the surface water resources in the project area is contained in Appendix C.

There are 10 proposed crossings of perennial streams, some of which are unnamed on the USGS 7.5-minute quadrangle maps. Available gauge records for the streams crossed by the proposed route are given

Table 3-13

STREAMS AND CANALS CROSSED BY THE PROPOSED PIPELINE

County	Stream Crossed*	Approximate Milepost**
Kern	Buena Vista Creek (I)	2.3
	Salt Creek (I)	15.0
	Temblor Creek (I)	16.0
	Chico Martinez Creek (I)	18.3
	Ditch crossing (C)	21.0
	Ditch crossing (C)	27.0
	California Aqueduct (C)	32.0
	53 unnamed, intermittent creeks	
Kings	California Aqueduct (C)	61.3
	Arroyo Doble Gado (I)	65.5
	Arroyo Finito (I)	66.4
	Arroyo Pequeno (I)	66.8
	Arroyo Hondo (I)	67.4
	Arroyo Torcido (I)	69.0
	Arroyo Bifido (I)	70.3
	Arroyo Largo (I)	71.9
	15 unnamed, intermittent creeks	
Fresno	Arroyo Vadoso (I)	73.9
	Los Gatos Creek (P)	79.3
	Pleasant Valley Aqueduct (C)	84.8
	1 unnamed perennial creek	88.6
	Domergine Creek (I)	94.5
	Martinez Creek (I)	97.0
	Salt Creek (I)	99.6
	Cantua Creek (I)	101.8
	Arroyo Hondo (I)	106.6
	Arroyo Ciervo (I)	108.9
	Panoche Creek (I)	122.2
	Little Panoche Creek (I)	135.2
	73 unnamed, intermittent creeks	
Merced	Ortigalita Creek (I; 4 crossings)	146.9, 147.5 147.8, 148.3
	Salt Creek (I)	151.2
	Delta Mendota Canal	163.8
	California Aqueduct (C; 2 crossings)	159.9, 165.7
	Quinto Creek (I)	168.3
	Mustang Creek (I)	172.0
	22 unnamed, intermittent creeks	

*I = intermittent streams
P = perennial streams
C = controlled flow

**As measured from south to north

Table 3-13 (Cont.)

County	Stream Crossed*	Approximate Milepost**
Stanialaua	Garzaa Creek (I)	174.7
	Oreatimba Creek (I)	179.4
	Crow Creek (I)	183.4
	Little Salado Creek (I)	187.0
	Salado Creek (I)	187.4
	Del Puerto Creek (I)	192.5
	Martin Creek (I)	199.2
	Arkansas Creek (I)	200.7
	13 unnamed, intermittent creeks	
San Joaquin	Hospital Creek (I)	202.7
	Lone Tree Creek (P)	203.9
	Deep Gulch (I)	206.3
	Hetch-Hetchy Aqueduct (C)	206.8
	Corral Hollow (I)	210.3
	Patterson Run	217.0
	10 unnamed, intermittent creeks	
Alameda	Mountain House Creek (I)	219.4
	9 unnamed, intermittent creeks	
Contra Costa	Brushy Creek (I)	226.3
	1 unnamed, perennial stream	227.0
	1 unnamed, perennial stream	230.2
	Kellog Creek (I)	231.9
	Deer Creek (I)	235.7
	Sand Creek (I)	238.2
	2 unnamed, perennial streams	248.6, 250.1
	2 unnamed ditches (C)	254.4, 255.9
	Contra Costa Canal (C)	254.1
	Mokelumne Aqueduct (C)	254.2
	Seal Creek (P)	254.5
	Walnut Creek (P)	256.5
	Pacheco Creek (P; 2 crossings)	256.6, 257.1
	36 unnamed, intermittent creeks	

I = intermittent streams
P = perennial streams
C = controlled flow

**As meaaured from south to north

Source: Ecology and Environment, Inc., 1986; based on USGS 7.5-minute quadrangle maps.

in Table 3-14. These data show typical flow conditions along the proposed route, reflecting watercourses highly susceptible to seasonal runoff. The pipeline also crosses the California Aqueduct in four locations, the Pleasant Valley Aqueduct, the Delta Mendota Canal, the Hetch-Hetchy Aqueduct, the Mokelumne Aqueduct, and the Contra Costa Canal. In addition, there are nine major and several small reservoirs within 2 miles of the proposed route (see Table 3-15).

With respect to the California Aqueduct, surface drainage is divided into three zones. In the project area from Kern County to Kettleman City, surface water runoff is diverted either over or under the aqueduct via overchutes and culverts even during periods of heavy rains. No culverts or overchutes exist along the aqueduct from Kettleman City to the O'Neill Forebay (corresponding to mileposts 63 to 160 of the pipeline), and drainage from the west side of the valley could enter the aqueduct during extended periods of heavy precipitation. Arroyo Passajero, located east of Coalinga about 10 miles east of Interstate 5, is a large sediment settling basin, the only such feature that could be affected by the project. From the O'Neill Forebay to its terminus, the aqueduct is protected from runoff by overchutes and culverts.

3.2.5 Groundwater

Data sources consulted in characterizing the existing groundwater resources within the project area included USGS professional papers, USGS water resources investigaton reports, and USGS water supply papers. In addition, technical bulletins of the California Department of Natural Resources, Division of Mines and Geology, were reviewed; and the Sanitary Engineering Branch of the California Department of Health Services was consulted, as well as the California Regional Water Quality Board, Central Valley District. Specific references cited in the text are included in the bibliography (see Section 11).

Regulatory Setting

Groundwater quality is regulated under the Federal Safe Drinking Water Act. Under the Porter-Cologne Act, the State Water Resources Control Board (SWRCB) administers the act through regulations based on a nondegradation policy regulating surface as well as groundwater pollution. The discharge of contaminated waters and oil spills are of concern due to their potential to affect surface and groundwater quality.

Environmental Setting

The project area is divided into four groundwater basins: the Tulare Lake Basin, the San Joaquin Basin, the Sacramento-San Joaquin Delta Basin, and the San Francisco Bay Basin (Templin 1984). The area is further divided into 15 sub-basins based upon a combination of political boundaries and natural features by the California Water Resources Control Board (see Figure 3-3).

Tulare Lake Basin. The Tulare Lake Basin is a closed depression with internal drainage except during exceptionally heavy runoff

Table 3-14

AVAILABLE GAUGE RECORDS FOR STREAMS
CROSSED BY THE PROPOSED ROUTE

Stream (County)	Watershed Area (mi^2)	Mean Annual cfs	Period Recorded	Maximum Discharge		Minimum Discharge		Remarks
				cfs	Date	cfs	Date	
Los Gatos (Fresno)	95.8	6.00	1945-1984	4,360	2-24-69	No flow (June-Sept.)		Minor diversion for irrigation and stock ponds
Cantua Creek (Fresno)	46.4	3.59	1958-1984	3,420	3-1-83	No flow (June-Sept.)		Some small dams for stock use above station
Orestimba Creek (Stanislaus)	134.0	17.20	1932-1984	10,200	4-2-58	No flow (June-Oct.)		No storage or diversion above station except for minor stock ponds
Del Puerto (Stanislaus)	72.6	7.80	1958-1965 maximums only 1965-1984	1,800	2-16-59	No flow (July-Sept.)		Some stock ponds and small diversions above station

Source: USGS, 1984, Water Resources Data, California, Water Year 1984, Vol. 3.

Table 3-15

RESERVOIRS WITHIN APPROXIMATELY TWO MILES
OF THE PROPOSED ROUTE

County	Reservoir
Fresno	Little Panoche Reservoir
Merced	Los Banos Reservoir O'Neill Forebay San Luis Reservoir Unnamed small reservoir (milepost 168)
Alameda	Bethany Reservoir
Contra Costa	Unnamed small reservoir (milepost 223) Unnamed small reservoir (milepost 229) Two unnamed small reservoirs (milepost 231) Unnamed reservoir (milepost 234) Several unnamed small reservoirs (mileposts 236-238) Marsh Creek Reservoir Contra Loma Reservoir Antioch Municipal Reservoir Mallard Reservoir Martinez Reservoir

Source: Ecology and Environment, Inc., 1986; based on USGS 7.5-minute quadrangle maps.

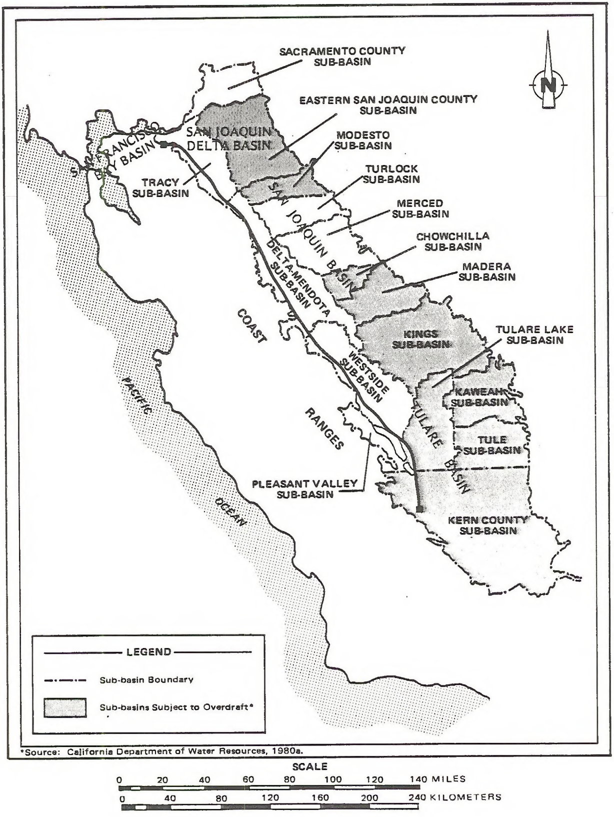


Figure 3–3 GROUNDWATER BASINS AND SUB-BASINS CROSSED BY THE SAN JOAQUIN VALLEY PIPELINE

from the Sierra Nevada. It is in a structural downwarp of a considerable thickness (up to 3,000 feet or more) of unconsolidated continental sediments of Pliocene and Pleistocene ages, most of which bear freshwater. Beneath these are marine rocks of older Tertiary and Cretaceous ages, which have salt or brackish water and primarily consist of relatively consolidated sandstones and shales. These crop out in the Coastal Ranges and the foothills of the Sierra Nevada. Normally, outflow from the basin is restricted to small subsurface flows in the western part of the basin. The basin includes part of Kern County, all of Kings County, and most of Fresno County.

Segment 3 of the proposed pipeline runs along the western side of the Elk Hills Anticline in Kern County. Groundwater is relatively high in total dissolved solids (>1,000 ppm), but is used for irrigation. Depth to groundwater is always greater than 10 feet (Wood and Davis 1959).

Part of Segment 2, from Kernridge to Kings County, lies within the Belridge and Lost Hills water districts. Again, water quality in the unconfined aquifers is poor, with total dissolved solids ranging up to 5,000 ppm. Along the western edge of Kern County, small quantities of groundwater are withdrawn for irrigation, for oil recovery in oil fields, and for domestic water supply needs. Total withdrawal amounts to about 20,000 acre-feet, with approximately 20% used for domestic purposes. Most withdrawals are from wells deeper than 100 feet, situated in the deeper parts of the valley east of the pipeline (Fryer and Cebell 1985).

Groundwater quality is poor in shallow aquifers along the western margin of the valley in Kings County. Potable groundwater is at 200 to 300 feet in the areas immediately to the east of the proposed route (Templin 1984).

Geologic and hydrologic conditions along the proposed route in Fresno County are similar to those in Kern and Kings counties up to the point where the proposed route enters the outcrop of Cretaceous marine sediments after crossing Little Panoche Creek, at the northwest corner of Fresno County. These sediments contain mostly brackish water or saltwater and are poor aquifers.

San Joaquin Basin. Geohydrologic conditions in the San Joaquin Basin are similar to those of the Tulare Lake Basin; the San Joaquin Basin receives overflows of surface water from the Tulare Lake Basin. Groundwater on the east side of the San Joaquin Valley tends to migrate into the Tulare Lake Basin, while groundwater on the west side in Fresno County tends to migrate from the Tulare Lake Basin into the San Joaquin Basin (Templin 1984).

Within the San Joaquin Basin in Merced and Stanislaus counties, the proposed route traverses outcrops of marine Tertiary and Cretaceous sediments in the foothills of the Coastal Ranges and alluvial fans at the foot of the hills. These sediments have poor supplies of freshwater and, for the most part, contain saltwater or brackish water. They are not used as water supply aquifers. Small quantities of freshwater are available in the alluvium of the creeks, but even surface water typically ranges from 900 ppm of total dissolved solids and up, with the exception of Little Panoche Creek (540 ppm of total dissolved solid) (Templin 1984).

San Joaquin-Sacramento Delta Basin. The proposed route cuts across the southwest corner of this basin in San Joaquin and northeast Alameda counties. The underlying geology is consolidated sediments of Tertiary and Cretaceous ages, with the same characteristics as those described above. Again, groundwater is high in total dissolved solids, and the bedrock makes poor aquifers.

San Francisco Bay Basin. Within Contra Costa County, only Brentwood and Oakley have municipal water wells close to the pipeline. the five Brentwood wells are located approximately 3 miles from the pipeline, but are only used in emergencies because of their high nitrate levels. The wells draw water from approximately 100 feet below surface. Oakley has one well 4 miles from the proposed route, which withdraws water from below 87 feet, beneath a layer of clay 17 feet thick. The water is high in total dissolved solids, and Oakley normally uses it only to supplement surface water (R. Hultquist, May 9, 1985). Within areas of bedrock outcrops, groundwater is high in total dissolved solids and aquifers are poor (Taff 1935). Close to the delta, unconsolidated sediments are intruded by brackish water. Some small quantities of freshwater will be available in the alluvial fill of valleys such as Lone Tree Valley, Marsh Creek, and Kellogg Creek and there are wells close to the pipeline route at Kellogg Creek.

3.2.6 Air Quality

Data Sources

Data sources include emissions inventories included in the project description, available literature, and contacts with the California Air Resources Board and local Air Pollution Control Districts (APCDs).

Regulatory Setting

Emissions in excess of 250 tons per year per pollutant require a Prevention of Significant Deterioration (PSD) permit. This permit protects against violations of ambient air quality standards by imposing limits on emissions and requiring the use of Best Available Control Technology (BACT). This federal PSD permit program can be administered at the local level by certain districts which have been granted such authority upon approval by EPA of an adopted set of rules and enforcement procedures. In the study area, only the Bay Area Air Quality Management District (BAAQMD) has been granted such authority. The BAAQMD includes the Alameda and Contra Costa County portions of the project region. However, it is unlikely that emissions from the project's booster stations will exceed the 250-ton limit and require a PSD permit.

In California, Air Pollution Control Districts (APCDs) may impose an Authority to Construct. Pursuant to this authority, a permit to operate may be required. Each district has emission standards and regulations governing sources, design, emissions, and control equipment. The proposed project traverses APCDs corresponding to Fresno, Kings, Merced, Stanislaus, and San Joaquin counties, in addition to the BAAQMD.

In general, an Authority to Construct is required prior to construction of facilities in each district in which a source of air emissions is proposed. The construction of a section of pipeline without pumping/heating stations in a given district would probably not require an Authority to Construct. Also, in most districts, small gas-fired heat transfer systems (generally less than 25 MMBTU/hr) and small capacity storage tanks for low pressure substances or pressurized natural gas storage tanks are exempt from permitting requirements. Sources requiring an Authority to Construct also require a Permit to Operate.

Each district has emission standards and other regulations which specify the design of some potential sources of air contaminant emissions and air pollution control equipment.

Environmental Setting

Climate and meteorology in the project area, which are important in determining pollutant dispersion, are described in Appendix D. The existing air quality conditions in the areas which would be affected by the proposed pipeline are discussed below. Areas that would be affected by project emissions include primarily the San Joaquin Valley Air Basin (which includes Kern, Kings, Fresno, Merced, Stanislaus, and San Joaquin counties) and part of the San Francisco Bay Area Basin, primarily Alameda and Contra Costa counties. The San Francisco Bay Area Air Basin will generally only be affected during construction of the project.

Ambient concentrations of specific pollutants have been monitored at several locations in both air basins. The resulting data indicate that air quality is generally good with respect to most pollutants except ozone (O_3), carbon monoxide (CO), and total suspended particulates (TSP), concentrations of which frequently exceeded state and federal air quality standards. All of the San Joaquin Valley Air Basin is classified as "nonattainment"* for ozone and carbon monoxide. Stanislaus County is also nonattainment for carbon monoxide. Therefore, pollution sources associated with the proposed project will be subject to federal, state, and local regulations to restrict increased net emissions of these pollutants or products which lead to their formation.

A summary of the federal attainment status for the five criteria** air pollutants in the counties affected by the proposed

---

*EPA air quality designations include "attainment," "nonattainment," and "unclassified."

**According to EPA nomenclature, a "criteria" pollutant is one for which a "criteria document" has been filed and thus for which ambient standards have been set.

project is given in Table 3-16. All of these counties are classified nonattainment for ozone. In addition, Alameda, Contra Costa, and Stanislaus counties are nonattainment for carbon monoxide. Counties in the San Joaquin Valley Air Basin are nonattainment for TSP.

Ambient air pollutant concentrations have been monitored by the California Air Resources Board and County Air Pollution Control Districts. Table 3-17 summarizes three years of data on maximum pollutant concentrations for several air quality monitoring stations in the proposed project area.

Ozone is a secondary pollutant formed in the atmosphere by chemical reactions involving sunlight, nitrogen oxides (NO_x), and reactive hydrocarbons. These reactions occur over a several hour period while the reactants are carried by the wind. Table 3-18 summarizes the number of occurrences of ozone concentrations which exceeded state and federal standards from 1982 to 1984 at several monitoring stations in the project region. Exceedances* of state and federal standards over the same period by the inert pollutant carbon monoxide and TSP are summarized in Tables 3-19 and 3-20, respectively.

3.2.7 Socioeconomics

Data Sources

Information from the following federal, state, and local agencies was used to describe existing socioeconomic conditions in the project area: U.S. Department of Commerce, Bureau of the Census; California Department of Finance; California Board of Equalization; California Regional Water Quality Control Board, Central Valley District; Kern County Planning and Development Services; Kern County Board of Trade; Crown Development Corporation of Kings County; Fresno County and City Chamber of Commerce; Merced County Office of Economic and Strategic Development; Stanislaus County Chief Property Appraiser; Stanislaus County Housing Element; San Joaquin County General Plan; Contra Costa County; City of Coalinga, City Manager; and Pannell Kerr Forster's hotel forecast (1985) for the state.

Regulatory Setting

No regulatory authorities or procedures other than NEPA and CEQA apply to the proposed project with regard to the project's socioeconomic setting. County and municipal permits or approvals are addressed under the land use section (see Section 3.2.9). Federal, state, and local tax laws pertain to the project and project personnel regardless of the siting of the project, as do a wide range of other laws and regulations governing normal business and social interactions.

---

*"Exceedance" is a term used by the EPA to mean an event characterized by a measured ambient concentration in excess of a National Ambient Air Quality Standard (NAAQS). It is not necessarily a violation of the standard, which may depend on the number or frequency of exceedances.

Table 3-16

AIR QUALITY DESIGNATIONS FOR COUNTIES TRAVERSED BY THE PROPOSED PIPELINE BASED ON NATIONAL AMBIENT AIR QUALITY STANDARDS

				TSP		SO_2	
Basin/County	O_3	CO	NO_2	Primary	Secondary	Primary	Secondary
San Joaquin Valley Air Basin*							
Fresno	N	A	A	N	N	U	U
Kern	N	A	A	N	N	A	A
Kinga	N	U	U	N	N	U	U
Merced	N	A	A	N	N	U	U
San Joaquin	N	A	A	N	N	U	U
Stanislaus	N	A	A	N	N	U	U
San Francisco Bay Area Air Basin							
Alameda	N	N	A	A	A	A	A
Contra Costa	N	N	A	A	A	A	A

*Portions of the air basins potentially affected by the proposed project.

A = Attainment
N = Nonattainment
U = Unclassified

Table 3-17

MAXIMUM POLLUTANT CONCENTRATIONS IN PROJECT AREA[1]

	Ozone (ppm)	CO (ppm)		NO_2 (ppm)		SO_2 (ppm)			TSP ($\mu g/m^3$)		Lead ($\mu g/m^3$)	
	1-Hr	1-Hr	8-Hr	1-Hr	Annual[2]	1-Hr	24-Hr	Annual[2]	24-Hr	Annual[3]	30-Day	Quarterly
McKittrick									158	65.6*	.10	.08*
Taft									215	94.5	.11	.11
Bakersfield (Chester)	.14	14.0*	11.30*	.14	.030	.15	.050	.006				
Oildale (Manor St.)	.14			.11	.023	.11*	.047*	.011*	274	121.9	.34	.30
Kern Refuge									165	53.4	.11	.10
Kettleman City (Hwy. 41)	.10*								246	90.6		
Hanford	.13*								274	90.1		
Visalia (Church St.)		13.0*	5.40*	.11	.022	.02	.015	.001				
Sequoia (Ash Mtn.)											.08	.07*
Coalinga	.11								202	57.0*		
Five Points	.11*	3.0	2.30	.05*	.011*				191	68.4*		
Fresno (Olive St.)	.11	21.0*		.15*	.027	.07*	.020	.006				.98/.92
Los Banos									131	62.4*		
Merced (Health)		7.0*	3.90*	.07*	.020*				110	66.8*	.37	.32
Turlock	.16*								200	77.0*		
Modesto (14th St.)	.14*	15.0*	8.60*	.13	.026	.05	.017*	.002				
Stockton (Hazelton)	.15	17.0*	9.70*	.19	.022	.04	.016	.003	186	81.9*		
Stockton (Pacific)									177	60.9*	.51	.43
Livermore	.16	12.0	4.80	.15	.019				132	55.7*	.35	.33
Concord	.15	18.0	6.40	.13	.024	.07	.012	.000	141	45.6	.55	.43
Pittsburg	.16	9.0	5.10	.13	.018	.18	.050	.001	128	57.4	.35[4]	.31[4]
Modesto (Oakdale)									165	55.0*		

[1]Includes data from 1982-1984.
[2]Calculated by arithmetic mean.
[3]Calculated by geometric mean.
[4]Method used was atmospheric absorption.

*Data presented are valid but incomplete, in that an insufficient number of valid data points were collected to meet EPA and/or ARB criteria for representativeness.

Table 3-18

OZONE: DAYS/HOURS ABOVE STATE* AND FEDERAL** 1-HOUR STANDARDS

	1982		1983		1985	
	≥ 0.10 ppm	> 0.12 ppm	≥ 0.10 ppm	> 0.12 ppm	≥ 0.10 ppm	> 0.12 ppm
Bakersfield	45/136	7/13	50/145	7/10	39/101	2/2
Fresno	21/47	1/1	23/55	2/2	5/6	--
Five Points	0/0	--	4/8	--	1/2	--
Merced	48/199	6/10	--	--	--	--
Modesto	10/15	--	12/30	2/2	38/119	4/10
Stockton	6/10	--	17/40	4/6	19/35	2/2
Livermore	9/20	1/1	20/43	8/9	32/79	7/14
Concord	12/45	1/1	16/45	4/5	15/37	3/3

Source: California Air Quality Data; Annual Summaries, published by California Air Resources Board.

*California 1-hour ozone standard is 0.10 ppm, not to be equaled.

**Federal 1-hour ozone standard is 0.12 ppm, not to be exceeded more than an average of once per year.

Table 3-19

HOURLY CO CONCENTRATIONS > 20 ppm (CALIFORNIA AMBIENT AIR QUALITY STANDARD),
8-HOUR MEAN CO CONCENTRATIONS $\geq$ 9.1 ppm (CALIFORNIA AMBIENT AIR QUALITY STANDARD),
8-HOUR MEAN CO CONCENTRATIONS > 10 mg/m^3 (NATIONAL AMBIENT AIR QUALITY STANDARD)

	1982 (Day/Hour)			1983 (Day/Hour)			1984 (Day/Hour)		
	> 20 ppm	$\geq$ 9.1 ppm	> 10 mg/m^3	> 20 ppm	$\geq$ 9.1 ppm	10 mg/m^3	> 20 ppm	$\geq$ 9.1 ppm	> 10 mg/m^3
Bakersfield	0/0	1/1	1/1	0/0	0/0	0/0	0/0	0/0	--
Fresno	0/0	4/4	3/3	0/0	6/6	6/6	1/1	4/4	3/3
Five Points	0/0	0/0	0/0	0/0	0/0	0/0	--	--	--
Merced	0/0	0/0	0/0	--	--	--	--	--	--
Modesto	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	--
Stockton	0/0	0/0	0/0	0/0	1/1	1/1	0/0	0/0	--
Livermore	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	--
Concord	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	--

Source: California Air Quality Data; Annual Summaries, published by California Air Resources Board.

Table 3-20

TOTAL SUSPENDED PARTICULATES: OCCURRENCES OF 24-HOUR AVERAGE CONCENTRATIONS $\geq$ 100 $\mu g/m^3$ (CALIFORNIA STANDARD) AND > 150 $\mu g/m^3$ (NATIONAL SECONDARY STANDARD)

	1982		1983		1984	
	$\geq$ 100 $\mu g/m^3$	> 150 $\mu g/m^3$	$\geq$ 100 $\mu g/m^3$	> 150 $\mu g/m^3$	$\geq$ 100 $\mu g/m^3$	> 150 $\mu g/m^3$
McKittrick	23	1	3	0	--	--
Bakersfield	31	13	32	15	37	13
Fresno	38	9	23	5	31	5
Five Points	18	4	11	6	15	4
Merced	3	0	10	2	19	3
Modesto	12	2	7	1	9	1
Stockton	12	0	17	4	13	4
Livermore	0	0	1	0	2	0
Concord	2	0	0	0	2	0

Source: California Air Quality Data; Annual Summaries, published by California Air Resources Board.

Socioeconomic Setting

The proposed pipeline route traverses eight counties in the San Joaquin Valley in central California: Kern, Kings, Fresno, Merced, Stanislaus, San Joaquin, Alameda, and Contra Costa. Socioeconomic conditions in these counties are diverse, ranging from agri-based to retail trade/service-oriented economies.

Socioeconomic profiles for each of the eight counties are presented in Appendix C and these include information on population, employment, economic diversity, income, transportation networks, and housing. Table 3-21 presents a summary, and salient socioeconomic characteristics are described below. Note that unemployment statistics are seasonally adjusted.

Kern County is the nation's third most productive agricultural county and is the leading oil and mineral producing county in both California and the United States as a whole. Agriculture is also the largest economic sector in Kings County, Fresno County, and Merced County. Stanislaus and San Joaquin counties have a relatively diverse economic base including agriculture, government services, manufacturing, and wholesale/retail trade. Alameda County and Contra Costa County economics have been changing from rural to suburban and are based on a mix of economic activities including retail/wholesale trade, services, government, industry, and agriculture.

Alameda is the most populated county (1,208,200) and Kings County is the least populated (85,300). The labor force and employment have been steadily increasing along with the population. In March of 1986, unemployment rates ranged from approximately 17% in Fresno, Merced, and Stanislaus counties to a low of 5.9% in Contra Costa County. Average per capita income ranged from $15,785 in Contra Costa County to $9,285 in Kings County.

The principal communities within 50 miles of the proposed route are usually small in the southern and central portion of the project area (see Table 3-22). Tourism is generally important and accounts for $9 million in annual business revenue in Kings County, approximately $200 million in Kern and Fresno counties, and over $850 million in Alameda County.

Note that with respect to the lodging industry (i.e., transient hotels and motels), the entire project area is within the state's Central Valley and San Francisco Bay Area tourism regions. In the Central Valley region as a whole, the lodging supply increased by 8.8% between 1984-1985, and is projected to increase by another 4.7% in 1986. Of the total 8 million rooms available annually (i.e., the number of rooms available on a daily basis, 365 days a year) in the region, approximately 64.5% are typically occupied; this annual occupancy rate is slightly below the 67.6% rate for the state as a whole. In contrast, the San Francisco Bay Area region, which encompasses the northern portion of the proposed project, has traditionally maintained occupancy rates of over 70%; of the 18.4 million rooms available, 12.9 million are occupied on an annual basis (Pannell Kerr Foster 1985). These general descriptions of occupancy rates apply to the project

Table 3-21

SUMMARY ECONOMIC INFORMATION

County	Population			Income: Per Capita Personal Income (dollars)				% Unemployed (March 1986)	Housing Stock (Units, 1980)	Primary Economic Sectors	1984 Tourism Expenditures ($)	1984 Tourism-Related Jobs	Number of Hotel/ Motel Rooms
	1980*	1986**	% Increase	1981	1982	1983	State Rank						
Kern	403,089	486,800	20.77	10,424	10,633	10,848	28	14.1	165,959	Agriculture, mineral production, manufacturing, defense/aerospace industry	200,000,000	4,286	>3,000
Kings	73,738	85,300	15.68	9,197	9,162	9,285	50	14.9	29,000	Agriculture, government, trade	9,045,000	202	100-150
Fresno	514,621	580,200	12.74	10,451	10,542	10,922	26	16.8	60,000	Agriculture, government, manufacturing, services	224,674,000	4,952	>6,400
Merced	134,560	162,100	20.47	9,302	9,538	9,730	40	16.8	55,091	Agriculture, government, trade, services	33,973,000	774	2,000
Stanislaus	265,900	309,400	16.36	10,095	10,438	10,687	31	17.0	116,049	Agriculture, services, manufacturing	73,246,000	1,723	1,450†
San Joaquin	347,342	423,200	21.84	10,474	10,621	10,906	27	13.9	156,053	Government, manufacturing, agriculture, trade	100,443,000	2,292	780†††
Alameda	1,105,379	1,208,200	9.30	12,483	13,148	13,971	8	6.5	475,252	Services, trade, government, manufacturing	857,306,000	14,974	10,000††
Contra Costa	656,380	724,000	10.30	14,243	14,888	15,785	5	5.9	278,400	Trade, services, government, manufacturing	121,287,000	3,171	10,000††

Key:

*U.S. Department of Commerce, Bureau of the Census, 1980 Census of Housing.
**U.S. Department of Finance, Population Research Unit.
†Modesto area only
††Alameda and Contra Costa combined.
†††County total not available; shows rooms available within 50 miles of pipeline route.

Sources:
- Survey of Current Business, April 1985, U.S. Department of Commerce, Bureau of Economic Analysis.
- U.S. Department of Commerce, Bureau of the Census, 1982; California Department of Finance 1985.
- Chambers of Commerce, Tourist and Convention Bureaus, Boards of Trade.

Table 3-22

POPULATIONS (1986) OF THE PRINCIPAL COMMUNITIES WITHIN 50 MILES OF THE PROPOSED ROUTE BY COUNTY

County	Community	Population (1986)
Kern	Taft	6,177
Kinga	Avenal	4,544
	Kettleman City	1,051*
	Hanford	24,861
Fresno	Fresno	285,000
	Coalinga	7,825
	Mendota	6,875
Merced	Merced	46,410
	Los Banos	12,619
	Gustine	3,569
	Dos Palos	4,184
Stanislaus	Patterson	5,020
	Newman	3,418
	Modesto	131,377
San Joaquin	Tracy	25,436
	Stockton	181,625
Alameda	Livermore	53,981
	Dublin	17,793
	Alameda	75,232
Contra Costa	Concord	107,900
	Martinez	27,460

Source: California Department of Finance data for 1986.

* 1980 Census data.

area; as a result, only county-specific lodging data are presented in Appendix c. The transient lodgings listed for each county in the appendix include only hotels and motels within 50 miles of the route, and of these, only those facilities rated by the American Automobile Association (AAA) meet certain quality standards. Since no camping areas or non-AAA listed facilities are included, the estimate of available transient lodging is necessarily conservative.

The eight-county region has a well-developed infrastructure including several interstate and state highways. Major highways crossed by the proposed route are listed in Table 3-23 by county. The Southern Pacific Railroad is crossed in Kings County and in Fresno County.

3.2.8 Noise

Data Sources

The following federal, state, and county agencies and regulatory documents were consulted in reviewing the environmental noise feature of the proposed pipeline: EPA, DOT, OSHA, the California Government Code, and the noise elements of the various general plans of the eight affected counties.

Regulatory Setting

Neither the federal government nor the State of California has specific regulations for community noise that are directly applicable to the proposed project. The state does require that counties and cities prepare noise elements as part of their mandated general plans (California Government Code ss.65302[g]). The state has also issued guidelines for preparation of these noise elements indicating the limits of acceptable community noise exposure levels which will apply to the proposed route. The guidelines indicate that an exterior noise exposure up to 60 dB(A)* L_{dn} or Community Noise Equivalent Level (CNEL) is "normally acceptable" for low density residential areas, which is the most restrictive category. Among the various noise receptors along the proposed route, it is expected that only those near a proposed injection or booster station would be affected by project-related noise beyond the construction period.

Guidelines and standards regarding noise are discussed below for each of the counties traversed by the proposed pipeline.

Kern County. Kern County has a specific noise ordinance that may require an acoustical study. This decision is made by the planning director for the county on a project-specific basis.

---

*dB(A) = decibels (20 micropascals) on the "A" scale of the sound level meter (American National Standards Institute 1971). L_{dn} = the day-night sound level (24-hour equivalent level) calculated by adding 10 decibels to sound levels from 10 p.m. to 7 a.m.

Table 3-23

MAJOR HIGHWAYS NEAR AND/OR CROSSED BY THE PROPOSED ROUTE, BY COUNTY

County	U.S. and Interstate Highways	State Highways
Kern	5	58, 33, 46, 99
Kings	5	33, 43, 41, 99
Fresno	5	198, 145, 33, 99
Merced	5	33, 152, 202, 99
Stanislaus	5	33, 132, 99
San Joaquin	580	4, 120, 99
Alameda	580, 680 Route 50	84, 21, 9 17
Contra Coata	680, 580	4

Kings County. Kings County has recommended standards in its noise element of 60 dB(A) in residential areas during daylight hours, 55 dB(A) from 7 to 10 p.m., and 50 dB(A) from 10 p.m. to 7 a.m., for L_{dn} noise levels.* Exterior industrial source noise levels are limited to 70 dB(A) at all times. Allowances are made for transitional periods during which sound levels are being brought into compliance. Transition periods may not exceed three years, and at no time may sound levels exceed 80 dB(A) in commercial and industrial settings.

Fresno County. The noise element developed by Fresno County indicates a maximum daily L_{dn} for outdoor residential locations of between 45 to 60 dB(A), depending on the type of neighborhood. An L_{dn} for commercial/industrial sites was not developed, but maximum allowable daytime and nighttime levels are between 65 and 70 dB(A). Fresno County has indicated that areas of non-intensive development must not have stationary noise sources which have an "adverse effect" on adjoining property. Specific noise impact is evaluated on an individual basis with implementation of mitigation measures as necessary.

Stanislaus County. Stanislaus County's noise element is non-specific and uses instead state and federal standards applicable to a given activity and location. As such, it contains no specific regulations pertaining to the pipeline or related activities.

San Joaquin County. Noise studies conducted throughout San Joaquin County have resulted in noise contour maps of that region. State noise insulation standards are applicable to all new residential and other sensitive receptors that are to be within 60 dB(A) contours. Exterior sound levels are to be reduced to below 65 dB(A) for new noise-sensitive uses where possible.

Alameda County. The criteria established by Alameda County state that exterior noise should not exceed 60 to 70 L_{dn} for residential locales. Commerical/industrial areas are limited to 70 to 75 dB(A) L_{dn}, while outdoor recreation areas can have a maximum of 75 dB(A) L_{dn}.

Contra Costa County. The noise policies set forth in the Contra Costa County noise element allow for only 45 dB(A) (CNEL) in extremely noise-sensitive land use areas, such as park and recreation areas of existing or proposed residential development. The county will attempt to maintain levels below 60 dB(A) (CNEL) in other residential areas. Mitigation measures are to be implemented to bring high-level noise sources below 70 dB(A) (CNEL).

Environmental Setting

With the exception of the three counties at the northern terminus of the proposed pipeline, most of the areas crossed by the route are predominantly rural or agricultural, with generally few noise-sensitive receptors, such as residences, schools, or parks, in the immediate vicinity. Existing background ambient sound levels in various environments can generally by typified as shown in Figure 3-4.

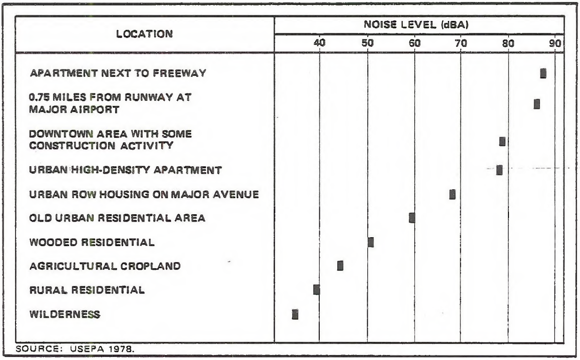


Figure 3–4 OUTDOOR DAY-NIGHT AVERAGE SOUND LEVELS AT VARIOUS LOCATIONS

As this figure shows, background ambient sound levels are represented by a rural low level of noise, typical also of residential areas in the evening. Where the project parallels Interstate Highway 5 (I-5), near highway crossings, and also near developments at the northern end of the pipeline, existing noise levels will be substantially higher and locally will exceed 70 dB(A).

3.2.9 Land Use and Recreation

This section describes land ownership, existing and proposed land use patterns, and recreational facilities that may be affected by the proposed project. It also summarizes local permits and approvals and issues of concern. A county-specific description of land use and recreation facilities for the project area is contained in Appendix C, which includes maps showing the locations of sensitive land use features.

Data Sources

Aerial photographs, USGS maps, BLM land status maps, and comprehensive county land use plans and maps were reviewed for existing land uses within the project area. State, county, and municipal agencies contacted included: California Department of Parks and Recreation; California Department of Transportation; California Department of Water Resources; Contra Costa County Community Development Department; East Bay Regional Park District; Kern County Board of Trade; Kern County Planning and Development Services; Kern County Parks and Recreation Department; Kings County Planning Agency; Kings County Public Works Department; Fresno County Parks and Recreation Department; Fresno County Planning Department; Fresno County Zoning; Fresno County Public Works and Development Services Department; Merced County Public Works Department; Stanislaus County Public Works Department; San Joaquin County Public Works Department; Alameda County Planning Commission; City of Antioch; City of Coalinga; and City of Pittsburg Community Development.

Regulatory Setting

The federal and state land use permits which are required will be those which pertain to the crossing of federal and state-owned lands, and waterways across which rights-of-way need to be granted. Land use controls are mostly of a local nature implemented at the county and municipal level and include zoning permits, approvals to cross county roads, blasting permits, and building permits. Numerous water districts require permits to cross canals and some require water appropriation permits. The types of permits vary from county to county and are identified in Appendix C for each county in the project area (see also Table 1-1).

Environmental Setting

The proposed pipeline will be constructed through eight counties. Since each of these counties has its own land use plans and goals, each county is discussed separately in Appendix C. Summary information is presented in Tables 3-24 through 3-27.

Table 3-24

DISTRIBUTION OF LAND USE TYPES ALONG THE PROPOSED ROUTE

	Total Miles of Pipeline Per County	Irrigated Agriculture		Dryland Agriculture		Rangeland		Industrial/ Commercial		Shrubland/ Woodland	
		Miles	%	Miles	%	Miles	%	Miles	%	Miles	%
Kern	44	15	34.1	4	8.2	16	36.6	9	21.1	0	0
Kings	27	6.7	24.7	2.6	9.8	17.2	63.7	0.5	1.9	0	0
Fresno	65	18	27.4	0	0	47	72.6	0	0	0	0
Merced	35	8	22.3	0	0	27	77.7	0	0	0	0
Stanislaus	30	0.3	1.1	1.7	5.6	28	93.3	0	0	0	0
San Joaquin	15	0	0	0	0	15	100.0	0	0	0	0
Alameda	5	0	0	0	0	5	100.0	0	0	0	0
Contra Costa	37	1	3.2	0	0	23	62.7	3	7.6	10	26.5
Total	258	49	19%	8	3%	178	69%	13	5%	10	4%

Table 3-25

SENSITIVE LAND USES ALONG THE PROPOSED ROUTE

County	Mile-post	Feature	Proximity to Pipeline (miles)
Kern	1	Industrial Area	Adjacent
	2	Derby Acres Park	1.0
	2	BLM Lands	Crosses
	3	Town of Derby Acres	0.7
	5	BLM Lands	Crosses
	6	State Highway 58	Crosses
	8	BLM Lands	Crosses
	9	Industrial Area	Adjacent
	19	Industrial Area	Adjacent
	20	State Highway 33	Crosses
	31	Lost Hills Park	0.5
	31	Lost Hills School	0.5
	31	State Highway 46	Crosses
	32	California Aqueduct	Crosses
	36	Interstate Highway 5	Crosses
Kings	61	California Aqueduct	Crosses
	61	State Highway 41	Crosses
	63	Kettleman City Fishing Access	0.3
	63	Town of Kettleman City	0.5
	70	BLM Lands	Crosses
Fresno	73	Interstate 5 Rest Area	0.2
	75	Interstate Highway 5	Crosses
	80	Proposed Coalinga Air Cargo Port	Crosses
	85	Pleasant Valley Canal (Bureau of Land Reclamation)	Crosses
	87	State Highway 198	Crosses
	90	State Highway 145	Crosses
	93	State Highway 33	Crosses
	136	Little Panoche Reservoir	0.9
Merced	152	Bureau of Reclamation Lands	Crosses
	153	Los Banos Creek Reservoir/ Recreation Area	Crosses
	157	Billy Wright Landfill	Adjacent
	158-160	Bureau of Reclamation Lands	Crosses
	159	State Highway 152	Crosses
	160	California Aqueduct	Crosses
	161-165	San Luis Reservoir State Recreation Area	--
	161-165	San Luis Reservoir/O'Neill Forebay	Crosses
	162	State Highway 207	Crosses

Table 3-25 (Cont.)

County	Mile-Post	Feature	Proximity to Pipeline (miles)
	163	Delta Mendota Canal	Crosses
	163	Delta Forebay Golf Club	0.9
	165	California Aqueduct	Crosses
	166-172	United Technologies Proposed Production Plant	Adjacent
Stanislaus	201	Interstate 5 Rest Area	Adjacent
San Joaquin	206	Hetch-Hetchy Underground Aqueduct	Crosses
	207	Tracy Golf Course and Country Club	Crosses
Alameda	219	Interstate Highway 580	Crosses
	222	Bethany Reservoir State Recreation Area	Crosses
Contra Costa	226	Proposed East Contra Costa County Airport	Adjacent
	234	Marsh Creek Reservoir	0.8
	240	Antioch Airport	0.3
	240	Municipal Golf Course	0.3
	241	Black Diamond Mines Regional Preserve	Crosses
	241	Contra Loma Regional Park	Adjacent
	244	Residential Area	0.4
	245	Residential Area	Adjacent
	247	Stoneman Park and Proposed Reservoir	Adjacent
	249	Residential Area	0.3
	251	State Highway 4	Crosses
	253	Naval Weapons Center, Concord	Crosses
	254	Residential Area	0.2
	254	Naval Weapons Station	Adjacent
	256	Industrial Area	Adjacent
	256	Pacheco Creek Canal	Crosses
	257	Residential Area	Adjacent
	257	Interstate Highway 680	Crosses

Table 3-26

RECREATIONAL FACILITIES: VISITORS INFORMATION

County	Facility	Size (acres)	Capacity (# Visitors)	Use (Visitors/Yr.)	Facilities
Kern	Derby Acres	3.8	---	No record	Picnicking; restrooms; playgrounds
	Lost Hills	7.6	---	No record	Picnicking; restrooms playgrounds
Kings	Kettleman City Fishing Access	0.5	---	---	---
Fresno	I-5 Rest Area	11	---	---	---
	Little Panoche Retention Reservoir	---	---	---	---
Merced	Los Banos Creek Reservoir State Recreation Area	2,475	---	74,090 (1985 data)	---
	San Luis Reservoir State Park	23,551	---	490,759 (1985 data)	---
	Delta Forebay Gulf Club	---	---	---	---
Stanislaus	I-5 Rest Area	---	---	---	---
San Joaquin	Tracy Golf and Country Club	140	---	210 memberships, use anytime	Golf; swimming
Alameda	Bethany Reser- State recreation area	300	No maximum capacity	16,575 (7/84-6/85)	Picnic areas; fishing
Contra Costa	Black Diamond Mine Regional Preserve	3,400	Varies	No record	Coal mine, silica mine
	Contra Loma Regional Park	83-acre lake; 776 total	5,000 per day	600,000	Swimming, boat rental; picnics (day use only); fishing; windsurfing; hunting; horseback riding
	Stoneman Park	278.87	No record	No record	Golf course

Table 3-27

EXISTING LANDFILLS NEAR THE PROPOSED ROUTE

County	Landfill	Type	Available Capacity (cubic yards)	Anticipated Date of Full Capacity
Kern	Taft Landfill	Sanitary	850,000	2048
	Buttonwillow Landfill	Sanitary	208,000	2003
	Lost Hills Landfill	Sanitary	1,874,000	2005
Kings	Corcoran Landfill	Sanitary	*	2013
	Hanford Landfill	Hazardous Materials	*	1993
Fresno	Coalinga Landfill	Sanitary	500,000 - 700,000	2005
	West American Avenue Landfill	Sanitary	>400,000	2005
Merced	Billy Wright Landfill	Sanitary	390,0000	1991
Stanislaus	Fink Landfill	Sanitary	500,000**	2015
San Joaquin	Corral Hollow Landfill	Sanitary	650,000	1990
Alameda	Altamont Sanitary Landfill	Sanitary	4,900,000	2019
Contra Cost	Contra Costa Landfill	Sanitary	*	1992-1994***
	Acme Fill	Sanitary	*	1987-1989***
	Proposed Kirker Pasa	Sanitary	26,000,000	2012-2020***

*Unknown
**Expansion planned for early 1990s will add 13.6 million cubic yards of capacity to this landfill.
***Environmental Impact Planning Corporation, 1986.

Source: Ecology and Environment, Inc.; based on County Public Works and Engineering Department- ment estimates.

The data in Table 3-24 indicate that the proposed project will be across 178 miles (69%) of rangelands; 57 miles of croplands (22%), which are mostly irrigated; 10 miles (4%) of shrub and woodlands; and 13 miles (5%) across industrial/commercial land.

Land ownership data are presented in Table 2-3; these data indicate that the project will cross 249 miles (96%) of private land and 9 miles of public lands mostly managed by the Bureau of Reclamation (3.5 miles) and the BLM (2.3 miles).

Table 3-25 presents a detailed inventory of land use features near and/or traversed by the project. The details pertaining to recreation areas included in this table are tabulated separately in Table 3-26.

Table 3-27 lists existing landfills which might be available for disposal of wastes from the project and data pertaining to these facilities.

3.2.10 Visual Resources

Data Sources

A review of existing policies regarding visual resource management in the areas along the proposed route was conducted to determine which portions of the pipeline right-of-way and ancillary facility sites would be located in visually sensitive areas that have special policies for the protection of visual resources. The review included the general plans for each of the eight counties in the project area; the general plans for the East Bay Regional Park District and the CalTrans Master Plan of State Highways Eligible for Official Scenic Highway Designation; the visual resource objectives and policies in the general plans for the cities of Antioch, Pittsburg, and Martinez; and BLM's revised Visual Resource Management Program (BLM 1985).

The analysis was conducted using a combination of aerial photographs and large-scale USGS topographic maps to determine visibility and landscape characteristics. On-site inspections were made and photographs were taken in sensitive visual resource areas.

Regulatory Setting

Federal. Federal regulations regarding visual resources apply only to lands owned and managed by the federal government. Only a small portion of the project (less than 8 miles of right-of-way) is located on federal lands including lands of the BLM, Bureau of Reclamation (BOR), and Department of Defense (DOD). BOR and DOD do not have specific policies for visual resource management, while the BLM has developed a method called the Visual Resource Management (VRM) system (BLM 1985). The VRM system is applied to proposed projects to determine their degree of potential contrast with the surrounding landscape and the relation to the specific VRM class for the area in which they would occur. An explanation of the system appears in Appendix E.

State. Although only a small portion of the project (1 mile) is located on state land, visual resource management policies would apply along designated or potentially designated scenic routes of the California Department of Transportation. The California Scenic Highway Program was established in 1963 to preserve scenic corridors. The local jurisdiction is responsible for preparing a program to protect or enhance scenic corridors selected for designation as a State Scenic Highway. The state's minimum requirements are: regulation of land use, including density and intensity of development; land and site planning; control of outdoor advertising; attention to and control of earthmoving and landscaping; and the design and appearance of structures. Development and activities proposed in designated scenic corridors are governed by the performance standards specified in the local jurisdiction's scenic highways program.

County and Local. County, city, and other local jurisdictions have established visual resource management objectives and policies in their general plans which apply to various portions of the proposed project. As noted, local jurisdictions apply specific policies for control of visual resource alterations along designated State Scenic Highways. In addition, many local jurisdictions have designated other scenic routes and have established protective policies for areas of high scenic value or sensitivity.

Environmental Setting

Visual Resource Areas

The proposed route traverses a variety of visual landscapes composed of varying terrain, rural and urban settlement patterns, vegetation, water features, roads, trails, utility corridors, and other natural features and cultural modifications. These visual elements have been characterized and classified according to the VRM system developed by the BLM, but with modifications for this project. Under this modified VRM classification system, both scenic quality and sensitivity level are combined to define three VRM classes. VRM classes along the proposed pipeline route at the ancillary facilities sites are indicated in Tables 3-28 and 3-29.

Visual Resource Management Class 1. VRM Class 1 is defined as areas of superior visual landscapes in which existing management policies guard against permanent alteration of the landscape. Proposed landscape alterations may be controversial and/or require relocation/redesign of project features and/or other mitigation measures.

Extensive VRM Class 1 areas are located along Segment 4 of the proposed route in Contra Costa County. This stems in part from the concentrations of large populations (viewers) in the county, including Pittsburg and Antioch. The VRM Class 1 areas along the pipeline route are located predominantly in the scenic hill lands of the Coastal Range in Contra Costa County near dense populations, where important areas have been protected as part of the East Bay Regional Park District, and along numerous scenic roads, trails, and bicycle paths.

Table 3-28

MATRIX OF VISUAL RESOURCE AREAS
ALONG THE PROPOSED ROUTE

Segment	Milepost	VRM Class	General Description	View* From
1	0 - 2	3	Disturbed flat area, oil field	MG: Derby Acres
1	2 - 4	2	Open plain	FG: Derby Acres
1	4 - 8	2	Open, low hills	MG: McKittrick
1	8 - 12	3	Disturbed flat area, oil field, tanks	MG: McKittrick
1	12 - 18.5	3	Disturbed flat area, oil field	--
2	18.5 - 35	3	Flat agricultural fields	--
2	35 - 40	3	Flat fields and trans-mission lines	FG, MG: I-5
3	40 - 61	3	Flat fields and trans-mission lines	FG, MG: I-5
3	61 - 63	3	Flat fields and trans-mission lines	FG, MG: I-5 MG: Kettleman City
3	63 - 71.3	3	Flat fields with gullies and trans-mission lines	FG: I-5
3	71.3 - 80	1	Flat agricultural fields and scenic route	FG: I-5**
3	80 - 84	2	Flat fields	FG, MG: I-5**
4	84 - 87.5	3	Flat fields	BG: I-5**
4	87.5 - 88.5	1	Flat fields, oil field, scenic route crossing	FG: Highway 198**

*Key: FG = view in foreground; MG = view in middleground;
BG = view in background; SS = seldom seen

**Designated scenic route

Table 3-28 (Cont.)

Segment	Milepost	VRM Class	General Description	View* From
4	88.5 - 104	2	Low hills, flat fields, transmission lines	FG, MG: I-5**
4	104 - 116	1	Flat fields, low hills with gullies	FG: I-5**
4	116 - 135	2	Low hills with gullies, transmission lines	MG: I-5**
4	135 - 148	3	Grassy hills with gullies and transmission lines	SS
4	148 - 152	3	Grassy hills with roads	SS
4	152 - 158.5	2	Grassy hills with gullies, transmission lines and agricultural land	MG: I-5**
4	158.5 - 163	1	Gentle agricultural land, scenic route crossings, bicycle route crossing	FG: Highway 152** FG: Highway 207**
4	163 - 168.5	3	Flat grasslands and transmission lines	BG: Highway 207** BG: I-5**
4	168.5 - 174	1	Hilly grasslands, transmission lines, aqueduct, near a residence	MG, BG: I-5**
4	174 - 179.5	3	Flat to hilly grasslands and transmission lines	MG, BG: I-5**
4	179.5 - 181	2	Flat to hilly grasslands and transmission lines	FG: Orestimba Park Site
4	181 - 192	3	Flat to hilly grasslands	SS
4	192 - 203	1	Flat and hilly grasslands and transmission lines	FG: Del Puerto Canyon Road** FG: I-5** MG: Ingram Creek Park Site

*Key: FG = view in foreground; MG = view in middleground; BG = view in background; SS = seldom seen

**Designated scenic route

Table 3-28 (Cont.)

Segment	Milepost	VRM Class	General Description	View* From
4	203 - 220	1	Flat and hilly grasslands	FG: I-5** FG: Golf Course BG: Tracy
4	220 - 224.5	2	Hilly grasslands, scenic route crossings, wind farms and transmission lines	FG: I-580** FG: Altamont Pass Road **
4	224.5 - 227.5	2	Hilly grasslands	SS
4	227.5 - 235	1	Low hills, grasslands, pipeline right-of-way	FG: Vasco Road** FG: Camino Diablo Road** BG: Brentwood
4	235 - 244	1	Hilly grasslands, scenic route crossings, parkland crossing	BG: Brentwood and Antioch Deer Valley Road** Passo Corto Road** Somersville Road** FG: Contra Loma Park
4	244 - 245.5	2	Grassy hills and transmission lines	MG: Pittsburg
4	245.5 - 246.5	1	Grassy hills	FG: Railroad Avenue**
4	246.5 - 247	2	Grassy hills and transmission lines	BG: Pittsburg
4	247 - 252	1	Grassy hills	BG: Pittsburg and Concord FG: Highway 4**
4	252 - 254	1	Grassy hills	BG: Pittsburg and Antioch
4	254 - 256	2	Flat wetlands, transmission lines	BG: Highway 4**
4	256 - 258	3	Flat, oil tanks, transmission lines, industrial uses	BG: Highway 4**
4	258 - 259	2	Fields, residential	FG: Vine Hill

*Key: FG = view in foreground; MG = view in middleground; BG = view in background; SS = seldom seen

**Designated scenic route

Table 3-29

MATRIX OF VISUAL RESOURCE AREAS
AT THE ANCILLARY FACILITIES SITES

Facility	Milapoat	VRM Clasa	General Deacription	Viaw* From
Microwava No. 1	0	3	Disturbed flat araa, oil fiald	MG: Derby Acres
Microwava No. 1A McKittrick Station	8.5	3	Disturbed flat araa, oil fiald, tanks	MG: McKittrick
Microwava No. 2 and Karnridga Station	18.5	3	Diaturbed flat araa, oil fiald	--
California Aquaduct Crossing	32	3	Flat agricultural fields	SS
Mid Station and Microwave No. 3	40	3	Flat agricultural fielda	FG: I-5
California Aquaduct Crossing	61	3	Flat agricultural fialda, transmisaion lines, roads	FG: I-5
Kattleman Station and Microwava No. 4	62	3	Flat agricultural fields, transmission lines, oil tanka	FG: I-5 MG: Kettleman City
Caliola Station and Microwava No. 5	84	2	Flat agricultural fialda, existing pumping station	MG: I-5**
Microwave No. 6		2	Rolling graaslands	MG: I-5**
Microwava No. 7		2	Flat fialda	MG: I-5**
SJV-2 Booster Station and Microwava No. 8	124	2	Flat agricultural fields, transmisaion lines	BG: I-5**
Panocha Creak Crosaing	136	3	River vallay, roads and tranamission lines	FG: Panoche Road BG: I-5**
Microwava No. 9		3	Graasy hills	BG: I-5**
California Aquaduct Crossing	161	2	Flat agricultural fields, bicycla routa crossing	MG: I-5** MG: Highway 152**
Delta Mandota Canal Crossing	164.5	2	Flat grasslands, transmission linea	BG: Highway 152** BG: I-5**
California Aqueduct Crossing	166.5	2	Flat grasalanda	BG: I-5**
Microwava No. 10 and SJV-3 Booster Station	171	1	Graasy hills	MG: I-5**
Microwava No. 11		2	Steep hills	BG: I-5**
Microwava No. 12		2	Staep hills (Mt. Oao)	BG: I-5**
SJV-3 Boostar Station and Transmission Lines		1	Grasslanda and transmisaion linea	FG: I-5**
Microwava No. 13		1	Mountain, park land	FG: Mt. Diablo Stata Park BG: Concord, Martinez
Microwava No. 14		2	Urbanized area	FG: Martinez

*FG = view in foreground; MG = view in middleground; BG = view in background; SS = seldom seen
**designated scenic route

Elsewhere along the pipeline route, the Class 1 areas are located predominantly along designated or eligible scenic roadways.

Visual Resource Management Class 2. VRM Class 2 is defined as areas of mostly common visual landscapes with some outstanding visual resources. Evident alterations of the visual landscape may be significant. Proposed permanent landscape alterations may be controversial in some areas; mitigation may be required.

VRM Class 2 areas are located predominantly in Contra Costa County where integral vistas are located adjacent to Bay Regional parks, such as Black Diamond Mines and Contra Loma. The hilly areas of the Coastal Range have widespread areas of Class A and B scenic quality (see Appendix E). Much of the Class A areas are located in rural settings, fairly remote areas from population centers. However, use probably is substantial, although concentrated on roads and trails throughout the area. For this reason, the area has medium sensitivity.

In the southwestern part of Stanislaus County, the pipeline route crosses and roughly parallels a designated bicycle route and trends through the designated Lower Orestimba Creek Regional Park site. While this site has some landscape elements that qualify it for high visual quality designation, a major transmission line corridor trends through the middle of the site. The proposed pipeline route closely follows the transmission line corridor.

In Fresno County, where the pipeline route trends parallel to but about a mile or so distant from I-5, a designated scenic route, the area is considered within the integral vista of the highway. Much of the route in the county is Class 2, except where it closely aligns with I-5. VRM Class 2 lands are located near small population centers, such as Avenal and Lost Hills.

Class 2 areas in Kings and Kern counties occur near population centers.

Visual Resource Management Class 3. VRM Class 3 is defined as areas that are seldom seen, have common visual landscapes, or are visually degraded. Alterations of the visual landscape are not likely to have significant impact or raise substantial controversy; minor mitigation may be required to protect visual resources.

Except for the industrialized area near Martinez, the VRM Class 3 areas are located predominantly in the southern portion of the study area. In Stanislaus County west of Patterson and in Merced County, VRM Class 3 areas are located along the pipeline route where it trends parallel but a good distance west of I-5, a designated scenic route in this area, such that it forms a background element of the visual landscape. The route is located west of I-5 but behind hills that obscure the view from the highway or valley. The area has Class B scenic quality, with numerous transmission lines, and is a seldom seen area.

Almost all of Kings County and Kern County are comprised of Class 3 areas. This is partly because of a lower scenic quality rating in these areas. Class B and C areas predominate. The lower sensitivity rating is the result of low population, few scenic roads and trails, and a few localities of degraded visual landscape.

Scenic Resources

Segment 4 of the proposed pipeline crosses or trends parallel close to two Interstate highways, I-580 and I-5; portions of both are designated State Scenic Routes. I-580 is indicated as an eligible, but not officially designated, State Scenic Route in the California Master Plan of State Scenic Route in the California Master Plan of State Highways (California Department of Transportation 1974).

Interstate 5, in the portion located in San Joaquin County, is shown as an eligible, but not officially designated, State Scenic Highway. I-5 is an officially designated State Scenic Route in all of Stanislaus County and in the northern portion of Merced County to State Route 152. I-5 has no designation for inclusion in the State Scenic Route Plan in the portions located in southern Merced County (south of Highway 152), and in Fresno, Kings, or Kern counties (California Department of Transportation 1974).

In Merced County near Santa Nella, the pipeline route approaches within middleground viewing distance of I-5, a designated State Scenic Route in this area, and crosses Highways 207 and 152, both officially designated State Scenic Routes. Merced County Zoning Ordinance No. 309 and the General Plan provide strict control of use in the areas of Highways 207 and 152 to protect and preserve scenic views from the highways (County of Merced 1975).

In Fresno County, the pipeline route crosses Highway 198, an eligible, but not officially designated, route identified in the State Master Plan for Scenic Routes. In Fresno County, I-5 is a designated scenic highway in the County General Plan, but lacks that designation by the state (County of Fresno 1978).

In northwestern Stanislaus County, the pipeline route trends parallel and close to I-5 and approaches a designated bicycle trail between the highway and the canal (Stanislaus Area Association of Governments 1974). The pipeline also crosses a designated county bicycle trail west of Patterson that leads into Del Puerto Canyon. The road through Del Puerto Canyon is also designated a proposed scenic highway in the Stanislaus County General Plan. In northwestern Stanislaus County, the pipeline route trends along the edge of Ingram Creek State Park site located adjacent to I-5; the park has not yet been developed. A proposed microwave would be located in Mt. Diablo State Park. Since scenic resources are an important part of the land management plan, the state park has strict controls on development within the park. However, numerous communications towers already are located on the summit of Mt. Diablo.

I-5 is designated as an official San Joaquin County scenic route in the County General Plan.

I-580 is a designated Alameda County scenic highway. In addition, the proposed route crosses Altamont Pass Road, a designated Alameda County Scenic Route (Alameda County 1977).

In Contra Costa County, the proposed pipeline route crosses or approaches designated scenic roads in the county (Contra Costa County 1974, 1978):

- Scenic Freeway/Expressway - Highway 4

- Scenic Thoroughfares
  - Kirker Pass Road (Railroad Avenue)
- Scenic Minor Thoroughfares and Collectors
  - Paseo Corto Road
  - Lone Tree Way (close approach)
  - Vasco Road

- Scenic Rural Recreation Routes
  - Somersville Road
  - Deer Valley Road
  - Vasco Road/Walnut Boulevard
  - Camino Diablo

The City of Antioch General Plan also designates Somersville Road and Paseo Corto Road as open space, scenic routes. The latter is to be treated as a parkway. Antioch also has established an action program which places specific emphasis on retention of visual resources of the Diablo foothills, restrictions on soil disturbance, and landform alteration and watercourses.

Contra Costa County includes extensive areas of designated scenic resource preservation including all lands managed by the East Bay Regional Park District (EBRPD), notably the Black Diamond Mines Regional Park and Contra Loma Regional Park (East Bay Regional Park District 1980). Contra Loma Park is crossed by the proposed pipeline route; the route closely approaches the border of Black Diamond Mines Park. The pipeline route crosses two designated hiking and riding trails and two designated Class II and III bicycle routes (on road) in the EBRPD Regional Trails Plan (East Bay Regional Park District 1976, 1984). It also crosses a proposed regional trail of the EBRPD.

3.2.11 Paleontology

Data Sources

Data for the following description of paleontologic resources within the project area were compiled from records of previous geologic and paleontologic investigations and from a field survey of potentially sensitive segments of the project route.

Non-field data sources included the existing paleontologic overview for the project area (Woodward-Clyde Consultants 1986), references included therein, additional published descriptions of the geology (including geologic maps), published and unpublished paleontologic research papers, museum records, and interviews with individuals having first-hand knowledge of resources within specific subareas. References summarized in Woodward-Clyde (1986) include most of the pertinent paleontological literature. Sources consulted on the general geology of the area included papers and geologic maps in California Division of Mines 1954 and American Association of Petroleum Geologists (AAPG) 1968. More specific geologic information, in the form of 1:24000 scale geologic maps (Adegoke 1969; Dibblee 1980a, b, c, d, 1981a, b, c; Lettis 1982), was available for slightly more than half of the project route. Fossil locality records at the University of California Museum of Paleontology and curators at the San Bernadino County Museum and the George C. Page Museum in Los Angeles provided most of the data concerning distribution of previously known localities along the proposed route.

A 19-day field survey was conducted of those segments of the project route for which the data sources had indicated potential impacts on sensitive paleontologic resources.

Regulatory Setting

Effects of the proposed project on paleontological resources, especially those including vertebrate fossils, are addressed under CEQA (Public Resources Code 4097); NEPA (P.L. 91-190, Title 1, Section 101 [b]); Executive Order 11752 of December 17, 1973; and the Federal Land Policy and Management Act (P.L. 94-579).

Environmental Setting

The area near the western margin of the San Joaquin Valley provides a record of geologic and biologic history which spans more than 80 million years, dating from the late Cretaceous period. Under the combined influences of sporadic subsidence of the valley floor, uplift in the area of the Coastal Range, and worldwide sea level changes, sediments and included remains (fossils) of marine and terrestrial organisms have accumulated to produce an unusually complete record of past life and geography. This complex record has been almost continuously investigated during this century (Adegoke 1969; Payne 1974) and was of sporadic interest much earlier (e.g., Leidy 1865; see historical account in Church 1968).

Much of the paleontologic interest in the project area stems from the presence of both marine and terrestrial fossils. This important and rare attribute of the foothills region is a result of its former position at or near the shoreline of the inland seaway which occupied the present valley area during most of the time represented by its rock record. Sea level fluctuations caused alternating deposition of marine and non-marine sediments, preserving fossils of animals from both environments. The area thus provides temporal links between the sequences of fossil assemblages ("time scales") historically developed independently for the terrestrial and marine environments. Such links have increased in importance as geological and paleontological research has focused on short-term worldwide events such as mass extinctions and possibly catastrophic environmental change.

Another rare set of circumstances late in the valley's geologic history produced a significant accumulation of fossils near McKittrick. Tar, which seeped to the surface along a fault, appears to have caused the entrapment of mammals, reptiles, birds, and rarely-preserved insects. The diverse late Pleistocene fauna preserved in this area may equal or surpass that of the Rancho La Brea deposit in Los Angeles (Church 1968; Jefferson 1986; Woodward-Clyde 1986).

The only existing comprehensive paleontological inventory for more than minor segments of the proposed project area is that prepared by Woodward-Clyde (1986). That report includes detailed referenced descriptions of paleontologic resources and the geologic formations in which they occur along the proposed route. The field survey which that report recommends was subsequently performed and the data were integrated with that in the Woodward-Clyde report and other sources, as discussed above. A brief discussion of combined conclusions and general patterns of fossil distribution is included here.

The entire proposed route crosses sedimentary rock formations or young, unconsolidated sediments, all of which are potentially fossiliferous. However, the expected abundance and kinds of fossils vary widely from place to place, and paleontologic resource sensitivity likewise varies along the route. This report emphasizes fossils of vertebrate animals (as opposed to those of invertebrates and plants) because of their relative rarity and the scientific importance of individual specimens.

All but the youngest of the formations have been tilted from their original horizontal position by geologic forces which caused the uplift of the Coastal Ranges. Gradual, long-term erosion has removed parts of these formations so that rocks and included fossils of various ages are now at or near the surface throughout most of the proposed route. Those formations or parts of the formations with higher concentrations of fossils now exist at or near the surface as bands of varying width across the terrain, but are obscured in most areas by soil, vegetation, or thin deposits of surficial sediment. Thus, visual detection of fossils is possible in those areas where natural erosion or man-made excavations have removed this cover.

In obscured areas overlain by vegetation and overburden, the presence or absence of fossils must be inferred from the distribution of known nearby fossil localities, exposures of non-fossiliferous rocks, and the surface trends of different rock types. In advance of excavation, such inferences can be expressed only as relative probabilities of the existence of fossils along given segments of the pipeline route. Predictions of the kinds and importance of fossils are subject to similar constraints.

Analysis of non-field data (distribution of known localities in combination with geologic maps) permitted coarse-scale resolution of areas likely to include concealed fossils. Subsequent field investigation of these areas included direct examination of available exposures and certain localized severe bedrock disturbance or deep cover of surficial sediments. These new data led to improved identification of fossiliferous, non-fossiliferous, and paleontologically unimportant subzones of mapped geologic units and substantially narrowed the areas assessed to have a high potential for important, vulnerable fossils. Only about 33 miles (13.5%) of the proposed route are now considered most likely to possess sensitive vertebrate fossil resources. (A discussion of paleontological sensitivity criteria appears in Appendix F.)

The area with the highest potential for vertebrate fossils along the proposed route is near its southern end, in the vicinity of McKittrick. Known nearby localities and the distinctive asphaltic deposit in which they occur delineate a fossiliferous band which the proposed route crosses for about 0.2 miles. The expected abundance and scientific value of fossils here makes it an area of particularly high sensitivity. Within this area, however, fossils are not uniformly distributed, but typically occur in localized patches (Jefferson 1986), two of which were found very close to the proposed project.

The Tulare Formation underlies more than one-third of the segments of the proposed route identified as having high paleontologic sensitivity. Though most of the formation was deposited on land, marine and brackish-water sediments and fossil occur locally (as in the vicinities of Kettleman City and Coalinga), enhancing its scientific importance. The field survey revealed previously unrecorded marine and terrestrial vertebrate fossil localities within 500 feet of the proposed route in both these areas, suggesting that similar fossils will probably be encountered during grading and trenching for the pipeline. In the area of McKittrick, the close association of the Tulare Formation with the McKittrick Brea deposits increases its importance, though Tulare fossils appear to occur in lower abundance here. Nearby Tulare localities have raised paleontological questions which are as yet unresolved, and any new fossils may shed light on these problems. In some other areas investigated during the field survey, the Tulare Formation either was found to have low concentrations of fossils or was contaminated by older fossils reworked from previously uplifted formations, thus reducing its scientific value.

The San Joaquin Formation immediately underlies the Tulare, and also includes both marine and non-marine fossils, locally in high abundance. Despite extensive soil and vegetation cover, numerous vertebrate (and invertebrate) fossil localities had been previously recorded within and adjacent to the project area, and a number of additional specimens were found during the field survey. These occur within a 5-mile segment north of Coalinga, and near the proposed microwave site No. 6. This area has contributed to many published paleontologic investigations (e.g., Adegoke 1969 and included references), but much remains to be learned.

The San Pablo Group includes several formations (not differentiated in this report) of both marine and non-marine origin, all of which have considerable variability in local fossil content. Of about 15 miles of the San Pablo Group crossed by the proposed route, the field survey permitted identification of 2.5 miles with sufficient sensitivity for further consideration. The southernmost identified segment is in an area mostly obscured by soil and grass cover, but in the same part of the unit as, and geographically close to, known prolific terrestrial vertebrate fossil localities. Portions of this area, however, were eliminated because the very coarse sediments within the project right-of-way would not likely have preserved useful fossils. Shorter segments to the north are of marine origin, but specimens found during the survey included bird and possibly terrestrial vertebrate bones as well as marine fish teeth and bones.

The much older marine Kreyenhagen Formation (Eocene) is crossed for many miles by the proposed route in Contra Costa County, though most of it was found during the survey to be unproductive of vertebrate fossils. Two miles of the proposed route, however, cross a subunit of well-bedded white rock (diatomite) which contained well-preserved, complete fish skeletons as well as isolated teeth and bones, and rarely-preserved crustaceans (shrimp).

Three segments of the proposed route near its north end cross bedrock assigned to the Wolfskill Formation of Pliocene age. Terrestrial vertebrate fossils, both in previously known localities and at a new site discovered during the field survey, occur scattered throughout the formation, and may be encountered at any point along the 4.7-mile section of the proposed route. Known specimens include well-preserved skulls, jaws, and isolated bones and teeth of horses, camels, tapirs, elephants, carnivores, and deer.

3.2.12 Cultural Resources

A Class I cultural resources inventory was conducted and submitted to the California SLC as part of the project application. This information is supplemented by detailed field inventories of the proposed route which took place in July and August of 1986.

The Class I study area was defined as a 0.5-mile zone on each side of the proposed pipeline route; thus, the study corridor is 1 mile in width, although the area of direct impact that may result from construction activities is 80 feet in width. However, because of the potential for error when computing distances on 7.5-minute topographic quad maps, sites within 200 feet of the pipeline have been identified as within the baseline field study zone. The field survey covered the 80-foot zone.

A field evaluation was performed on all accessible lands along the proposed construction corridor, where identification of cultural resources was feasible. The survey included re-evaluation of previously recorded resources, where necessary, to determine significance. Lands omitted from the survey included those that are inaccessible due to lack of rights-of-entry and those in which identification of cultural resources was not feasible, such as deeply-ripped agricultural land, overflowed land, or land where the original surface has been covered by fill.

Data Sources

A review of existing cultural resource literature and available documentary resources was conducted for the project area. Background information concerning the prehistory, history, ethnography, and ethnohistory of the region was sought to provide a context for and to determine the prehistoric, historic, and ethnohistoric use of the area. A cultural resource record search was conducted at each of the following Archaeological Inventory Offices: Northwest Information Center at Sonoma State University, Rohnert Park, for Alameda and Contra Costa counties; Central California Information Center at California State College, Stanislaus, for Merced, San Joaquin, and Stanislaus counties; Central San Joaquin Valley Information Center at California State College, Bakersfield, for Fresno and Kings counties; and South Central Information Center at Bakersfield College, for Kern County.

Cultural resource inventories maintained by the BLM at the Caliente and Hollister Resource Area Offices also were reviewed. In addition, California Historical Landmarks listings and the NRHP were reviewed to identify any resources near the proposed route, as were the Historical American Building Survey and the Historical American Engineering Record. To augment these data, both the Historic Resources Inventory at the California State Historic Preservation Office (Sacramento) and Government Land Office files for 1850-1900 (BLM, California State Office, Sacramento) were carefully reviewed for indications of structural locations at which material evidence might still be found. Local historical societies, museums, and libraries also were contacted regarding properties in the study area. Information was solicited regarding structures or places of interest to local municipalities and ethnic or other special-interest groups not included in the above-mentioned inventories.

Ethnographic and ethnohistoric literature sources were reviewed to identify Native American village locations and other named places in the study area. Sources consulted included Cook's (1955, 1957, 1960, 1962) compilations of historic accounts, Latta's (1977) and Gayton's (1948) Yokuts ethnographies, and Bennyhoff's (1977) ethnogeographic study, as well as Krober's (1925) data, and Gifford and Schenck's (1926) attempt to correlate archaeological and historical data.

Letters providing a brief description of the proposed project and a location map were sent to Native Americans and organizations identified from county referral lists provided by the Native American Heritage Commission and from suggestions provided by the BLM anthropologist. Information also was solicited regarding concerns about places of heritage or religious significance that might be affected by project implementation. Initial response from the Native American community included a request to be kept informed of any planned archaeological or construction activities.

Regulatory Setting

The primary legislation relating to treatment of cultural resources during this project is Section 106 of the National Historic

Preservation Act, which establishes the procedures for compliance with other applicable legislation, including agency review. Existing federal and state laws that apply to the project include:

- Executive Order 11593, Protection and Enhancement of the Cultural Environment May 13, 1971 (36 FR 8921, 16 USC 470). This order makes various federal agencies responsible for the preservation of cultural resources of the nation and for identifying properties qualified for nomination to the National Register.

- Federal Land Policy and Management Act of 1976. This act extends the previous consideration into the realm of general planning.

- The Antiquities Act of 1906 (34 Stat. 225). This act establishes protection for archaeological sites and authorizes uniform rules and regulations to carry out this responsibility.

- The Historic Sites Act of 1935 (49 Stat. 666). This act establishes as public policy preservation of archaeological remains of national significance.

- National Historic Preservation Act of 1966 (80 Stat. 915). This act augments the provisions of the 1935 act to include sites and/or districts of local and regional significance as well as national significance.

- The National Environmental Policy Act of 1969 (91 Stat. 852). This act includes, as a responsibility of the federal government, to aid in decision making regarding impacts, including economic and technical considerations, of systematic actions affecting the environment.

- Native American Religious Freedom Act of 1978 (42 USC 1996). Guarantees inherent rights of Native Americans to follow their traditional religions, including access to sites, use and possession of sacred objects, and freedom to worship through ceremonial and traditional rites.

- California Environmental Quality Act (Public Resources Code, Section 21060.5). California's principal statute providing protection of archaeological resources is the California Environmental Quality Act of 1970 (CEQA). Modeled on the NEPA, CEQA requires that archaeological resources be evaluated during the evaluation of EIRs. On the basis of such evaluations, state agencies may impose restrictions on land use and require mitigation as a condition of permit issuance as an exercise of their authority. The guidelines for implementation of CEQA identify a number of projects that are categorically exempt from the requirement of preparing an EIR.

- California Native American Heritage Commission (Public Resources Code, Section 5097.94). This charges the Native

American Heritage Commission with identifying places of special religious or social significance to Native Americans and empowers the commission to "...bring an action to prevent severe and irreparable damage to... a Native American sanctified cemetery, place of worship, religious or ceremonial site, or sacred shrine located on public property...."

Local regulation regarding cultural resources in California is usually at the county level, and is generally closely tied to CEQA. This insures that compliance with the federal and state agencies will satisfy local statutes as well.

Environmental Setting

The Class I inventory study determined that 51 cultural resource inventories have been performed along, adjacent to, across, or within 0.5 miles of the proposed route. Most of these inventories were conducted within Kern or Contra Costa counties and cover about 10% of the route, or 20.2 miles. The 1-mile-wide study area contains 37 known cultural resources, of which three prehistoric sites and five isolated prehistoric finds occur 100 to 2,700 feet from the proposed route.

The sites on the route include two lithic scatters, a midden deposit, and an isolated find. The other prehistoric cultural resources identified within the study corridor include seven camp sites (some with midden deposits), four lithic scatters, three bedrock mortar sites, five isolated finds, and one area with hearth features.

There is not enough information available for most previously recorded sites to permit an evaluation of the significance of the sites near the route. This reflects an absence of specific data on the site survey forms and knowledge of the current condition of the sites. Based on field survey data, BLM and the State Historic Preservation Office (SHPO) will require an evaluation of any sites on the right-of-way to determine their eligibility for inclusion in the National Register.

The 13 historic period sites include four dumps, three sites with dumps/features, four with structural remains, one mine adit, and one oil drilling site. In addition to sites identified by the Class I inventory, a review of historic maps was conducted prior to the field survey; this review identified several potential historic sites in the study area.

There has been considerable archaeological work conducted in areas adjacent to the 1-mile-wide study corridor included in the Class I inventory. The majority of these cultural resource inventory studies in the Coastal Ranges, interior Coastal Ranges, and the San Joaquin Valley were related to water resource and mining developments, although other types of urban development projects initiated cultural resource studies in the Bay Area. Based on these previous studies, a tentative sensitivity model, identifying areas of high, moderate, and low potential for locating unrecorded archaeological resources, has been developed, as described below. In advance of the archaeological field survey, the model supplied a preliminary idea of what types of sites may have existed on the route and the probability of finding them in specific areas. It remains a good predictive tool for the cultural resources environment in the study area, since the narrowness of the survey corridor precluded general conclusions on areal distribution of resources.

- <u>High-Sensitivity Areas Within the Project Right-of-Way</u>. Water is of critical importance for human habitation in the western San Joaquin Valley and seasonal occupation/use can and did occur near annual drainageways. The mouths of creeks emptying into the San Joaquin Valley and the valleys west of these mouths are considered to have a high probability of containing cultural resources. Areas of high sensitivity include areas near streams on the alluvial fans east of the Coast Range stream valleys, old sloughs, and old tule marshes. The old shorelines of Lake Tulare may also be considered archaeologically sensitive, as "early man" projectile points have been found on these shorelines. The high sensitivity zones may produce midden sites, structural remnants (house pits), bedrock mortar sites, and lithic scatters. Human burials may be present in the midden sites, but these will be difficult to discern unless human bone has been displaced by rodents or erosion. The majority of the previously recorded sites and the one new site located during the survey are near reliable water sources.

  In the interior Coastal Ranges (Alameda and Contra Costa counties), areas of high archaeological sensitivity are watered valleys, terrace areas near streams, springs, and old estuarine areas or coastal marshlands. Large and small midden sites, bedrock mortars, rock art, lithic scatters, and shell mounds may be encountered. Burials may be present in the midden sites. All the known resources in the vicinity of the pipeline in this area are so situated--although industrial development has destroyed the evidence in coastal marsh zones.

- <u>Moderate-Sensitivity Areas Within the Project Right-of-Way</u>. These areas are less easy to define along the proposed route because there is little information available on the settlement pattern for the San Joaquin Valley area as a whole. Stream channels that are not well-developed and have narrow valleys are less likely to contain archaeological sites than the larger stream valleys. Small midden sites, bedrock mortar sites, lithic scatters, and camp sites with cultural deposits may be present in these zones. The survey revealed no sites at all on the proposed route in such settings, but the narrow corridor did not provide a comprehensive sampling of this type of terrain. The site density in these areas are assumed to be much lower than in high-sensitivity areas, and the corridor did not pass over any sites in these areas.

  Areas of moderate sensitivity in the interior Coast Ranges are zones that lack perennial water flow or spring areas and that do not have associated flats and gentle sloping ground. Small midden sites, bedrock mortar sites, lithic scatters, and rock art may occur in these zones. Temporary camp sites or special task sites may also be extant. Again, the survey did not record any sites in these areas.

- Low-Sensitivity Areas Within the Project Right-of-Way. These are areas of moderate to steep slopes, narrow stream canyons, and open grasslands that occur well away from water sources. These may be devoid of sites or contain evidence of low-intensity transitory use. Habitation sites will be absent. It is possible that bedrock mortar sites or rock art may occur where bedrock is present.

  In the interior Coastal Ranges, these zones will have steep to moderately steep slopes, steep-walled canyons, and open grasslands devoid of water sources. The same expectations for the San Joaquin zones apply to these areas. As site density in these areas would be very low, it is not surprising that the survey did not reveal any resources in these areas.

Resources from the Historic Period

The Class I inventory has defined, from the General Land Office maps, numerous historical features in the 1-mile-wide study corridor. Assessment of sensitivity is based on the knowledge that exploitation of resources underlies all settlement, both prehistorically and historically. Early historic settlement was geared more to individual aggrandizement of environmental resources; later economic expansion was more diversified. Therefore, early settlement may be expected to have occurred in the same high-sensitivity areas in the San Joaquin Valley as in the prehistoric period. Later occupation/use may be expected to occur in less desirable and seemingly less habitable areas. A good example of this would be the oil exploitation that centers in rather desolate areas of the southern San Joaquin Valley. The majority of the historic era sites along the route are expected to relate to agricultural or pastoral pursuits, but this can encompass a wide variety of site types, ranging from major structural remnants and water diversions to minor ditches and trash dumps.

The survey revealed no historic resources on the alignment, although several old farm buildings in current use are near the proposed route. The sites of potential historic resources identified during research but not found in the field are now almost inevitably cultivated fields.

Ethnographic Resources

The discussion of sensitivity for this subdiscipline is difficult. The Indians of the San Joaquin Valley and coastal zones suffered early and severe population dislocations from missionization practices. The plague of 1830 to 1833 further decimated the Yokuts. There are living descendents of southern Yokuts, but the Northern Yokuts have vanished. The Costonoan and particularly the Saclan (Bay Miwok) have few descendents. As a result of these decimations, there is little information concerning sacred lands, village names, or other aspects of settlement.

The ethnographic information that is available is not specific enough with regard to site location to indicate named villages or other features that lie along the pipeline route. The most that can be said about ethnographic sensitivity is that areas of concern will probably be associated with archaeological resources identified during the field inspection. Sensitive zones should closely parallel those identified for cultural resources of the prehistoric period.

The Class I inventory and field survey did not reveal any Native American concerns that could potentially be affected by the proposed project. Native American groups were contacted.

3.2.13 Terrestrial and Aquatic Biology

Data Sources

The information contained in this section was compiled from literature reviews, agency contacts, aerial surveys, and field study. Baseline data, including information from aerial photos (December 1985), USGS topographic maps, California Department of Fish and Game (CDFG) Natural Diversity Data Base (CNDDB) records, Wildlife Habitat Relationship Model (WHR), and observations made during overflights in May 1986, were used to prepare a preliminary description of existing biological conditions within the project area, and to formulate an approach to field survey of the project route. CDFG biologists in each region were contacted. The CNDDB office provided listings of known locations of special status animal species, plant species, and plant communities located within 1 mile of the project route. The United States Fish and Wildlife Service-Office of Endangered Species (USFWS-OES) provided listings of all threatened, endangered, and candidate species potentially occurring within the project area. OES's correspondence also included recommendations for field survey methods.

A scoping meeting was held in May 1986 with representatives from BLM, the USFWS-OES, CDFG, and SLC. Field study methods were reviewed. A field program designed to meet applicable state and federal environmental review requirements was approved.

Field study along the pipeline corridor was conducted in July and August 1986. The field program is described in detail in a Biological Assessment, available for public review at the BLM State Office and the SLC Office, in Sacramento. The study included characterization of vegetation types occurring along the project route, an intensive survey program for special status plants and animals (within a 400-foot corridor centered on the pipeline route), live trapping of small mammals, night-time spotlighting, and scent post stations.

Regulatory Setting

The USFWS and CDFG share responsibility for management and protection of natural resources in the project area. USFWS Region 1 oversees natural resource management in five western states; the project areas fall within the direct purview of the Sacramento Field

Office. The project area falls within three of the five CDFG regions. Region 2 responsibilities cover eastern Contra Costa and San Joaquin counties. Region 3 covers Alameda and western Contra Costa counties. Region 4 covers Fresno, Kern, Kings, Merced, and Stanislaus counties.

The Fish and Wildlife Coordination Act (FWCA) of 1978 requires that any federally permitted project, such as the proposed pipeline, be reviewed and approved by USFWS and CDFG with respect to the project's impacts on biological resources and proposed mitigation measures. The FWCA directs such projects to address Endangered Species Act (ESA) requirements, as discussed below, and directs both federal and state resource agencies to comment on the Corps of Engineers (COE) Section 404 Regulatory Program, also discussed below.

The proposed pipeline route traverses a number of areas where state or federally listed special status species could potentially occur. Under separate state and federal legislation, each agency conducts a detailed review and formal consultation process with the lead agency and project sponsor of a project that could affect any plant or animal species listed or proposed as rare, threatened, or endangered by the state or federal government. If a listed species may be affected, the lead agency must initiate a formal consultation with the USFWS or CDFG, as applicable to federal or state law.

Federal law dictates that all federal departments and agencies shall use their authority to conserve endangered and threatened species as declared in the ESA, Public Law 93-2, Section 7. The act defines as "endangered" any species which is in danger of extinction throughout all or a significant portion of its range (other than certain species of insects). A "threatened" species is any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Additional species of concern are divided into three further categories: (1) Proposed listing as threatened or endangered; (2) C1 Candidate, enough data are on file to support the federal listing; and (3) C2 Candidate, threat and/or distribution data are insufficient to support federal listing.

Section 7 of the biological assessment sets forth procedures to be used and requirements to be met by federal departments and agencies in order to comply with the act. Once a federal agency has determined that its action may likely affect an endangered species, the agency must initiate a formal consultation process. In that process, the lead agency prepares a biological assessment to be submitted to the USFWS, which details what species are present and whether suitable habitat exists; this assessment also analyzes the effects of the proposed action on the species (individuals and populations), including cumulative effects of the action, and analyzes alternative actions that may provide conservation measures. The USFWS then prepares a biological opinion to assess whether the project will jeopardize the continued existence of the species, to identify incidental take, to specify mandatory measures and other conservation strategies. Although Section 7 requires formal consultation only on those species currently listed as threatened or endangered, USFWS has recommended certain candidate species for consideration in this project assessment because they may become listed during the design and construction phases of the project.

The CDFG is the state's trustee agency for endangered and threatened species under CEQA. Section 21104.2 of CEQA directs each state agency to consult with CDFG on any project the agency initiates that is not statutorily or categorically exempt from CEQA. Section 15065(a) of the CEQA guidelines declares that impacts to rare or endangered plants or animals are significant. Section 1900 of the State Fish and Game Code, the Native Plant Protection Act, also affords limited protection to special status species.

The passage of the California Endangered Species Act (CESA) in 1985 gave CDFG a more clearly defined responsibility to review proposed projects for impacts on California listed rare, threatened, and endangered species. CESA defines California "endangered" species as those whose continued existence is jeopardized. California "rare" or "threatened" species, although not presently threatened with extinction, are in such small numbers throughout their range that they may become endangered if their environments change or deteriorate. CESA also revised the categories of officially listed species. All animals designated as rare by the Fish and Game Commission prior to January 1, 1985, were automatically reclassified as "threatened" by the legislation. The act did not do the same for plants, however, and until the Fish and Game Commission acts to change the listing of plants from "rare" to "threatened," there are none now so designated as of January 1986.

A formal consultation process must be initiated with CDFG for projects that the state lead agency has determined may or will have an effect on listed species. As with USFWS policy, candidate species are not subject to the same consultation requirements as listed endangered, rare, or threatened species. CESA does encourage informal consultation for candidate species that may become officially listed prior to completion of the CEQA process. For the proposed project, CDFG is being consulted by SLC, the state lead agency.

The proposed pipeline traverses several areas where wetlands are present, e.g., Pacheco Creek and Suisun Bay brackish marshes. Wetland areas of the pipeline corridor may be subject to Section 404 of the Clean Water Act (1972), under which the COE regulates disposal of dredged or fill material into "waters of the United States," including all streams to their headwaters (5 cfs average annual water flow); lakes over 10 acres; and contiguous wetlands (wetlands around San Francisco Bay occur in both diked, tidal, and some riparian situations). Pursuant to Section 404(b)(1), EPA also has developed comprehensive guidelines for review of permit applications and federally regulated or sponsored projects. These guidelines require that consideration be given to the need for the proposed project and the availability of alternate sites or construction methods that are less damaging to the environment. Need, in this context, means water dependency of the project.

For projects proposed in wetlands, COE evaluates the proposed site and makes a formal jurisdictional determination, delineating its areas of permit authority. COE solicits comments on permit applications through a public notice process, which initiates a public interest review of the project. By legislative order and government acts, including the FWCA, several agencies are given review and comment responsibility for all COE regulated projects. These agencies include USFWS, CDFG, SLC, and the National Marine Fisheries Service (NMFS); other agencies also comment, as appropriate to the location and issues of the application.

In addition, under Section 1603 of the Fish and Game Code, CDFG enters into formal Stream Alteration Agreements with the project sponsor. The agreements are required for each stream crossing which has the potential to affect the natural state of the stream within the mean high water mark. The proposed project crosses numerous perennial and intermittent streams.

The California Native Plant Society (CNPS) publishes and regularly updates the Inventory of Rare and Endangered Vascular Plants of California. The CNPS gathers information from the CNDDB, the CDFG, and amateur and professional botanists throughout the state. The inventory has become the standard reference on California's rare and endangered plants. Plants listed by CNPS but not officially listed by the state are nevertheless accorded equivalent protection under CEQA; that is, impacts to CNPS species are considered to be significant.

CNPS has developed a three-component scheme to assign plants to categories. These components are:

- Rarity--the extent of the plant, both in terms of numbers of individuals and the nature and extent of distribution;

- Endangerment--the perception of the plant's being threatened with extinction, for whatever reason; and

- Distribution--the general range of the plant.

In addition, plants are grouped into four lists. List 1 contains (A) plants presumed extinct in California and (B) plants rare and endangered in California and elsewhere. List 2 contains plants rare or endangered in California, but more common elsewhere. List 3 contains plants about which more information is needed. List 4 contains plants of limited distribution (a "watch" list).

Environmental Setting

From south to north, the proposed pipeline route traverses the western San Joaquin Valley, the foothills of the central Coastal Range (the Temblor and Diablo mountains), and the upland edge of marshes along the southern shoreline of Suisun Bay. Along the 258.3-mile alignment, the project passes through nine general habitat types that support a variety of wildlife species. This section describes the terrestrial and aquatic habitats and their associated wildlife. It highlights those plant and animal species and natural communities occurring within the project area which have been given special status by the state or federal government, have special wildlife values, and/or are considered to be potentially sensitive to project impacts. Common names for plants and animal species and their scientific names are listed on the following page.

TERRESTRIAL BIOLOGY

The description of terrestrial biology addresses first the vegetation and wildlife common to the project area and then focuses on the vegetation and wildlife that constitute sensitive biological resources within the project area. The basic habitat types, vegetation associations and characteristic wildlife along the project corridor are described, followed by a discussion of sensitive communities, special management interest areas, and special status plants and wildlife. References in the text to milepost (MP) locations along the proposed route are shown on Figures 3-5 through 3-13 included at the end of this section.

Habitat Types and Associated Wildlife

The proposed route passes through nine habitat types: Valley Grassland, Saltbush Scrub, Alkali Sink, Oak Savannah, Freshwater Marsh, Brackish Marsh, Riparian, Disturbed (e.g., oil production or abandoned agriculture), and Cultivated. These habitat types are described in Table 3-30, which presents characteristic plant and animal species occurring in each type. Figures 3-5 through 3-13 (at the end of this section) map the location of each of these habitat types along the proposed route.

Land uses and management practices (extensive agriculture, industrial and residential development) have significantly altered vegetation along the proposed route. A 1983 study of the Tulare Basin (the southern half of the San Joaquin Valley) concluded that the current areal extent of native vegetation on the valley floor represents less that 5% of its historic distribution (California Nature Conservancy 1983). The displacement of native vegetation has resulted in a reduction of both plant species richness and wildlife habitat.

Sensitive Biological Resources

Within the project vicinity, natural communities of concern and populations of a number of special-status plant and animal species have been identified as potentially occurring in the nine habitat types. These identified communities and species are considered particularly sensitive to potentially significant project impacts.

Biological Communities of Concern

Biological communities of concern discussed in this report consist of both those denoted as such by CNDDB and those identified as important by resource agency personnel and based on field survey. CNDDB considers saltbush scrub and alkali sink to be Communities with High Inventory Priority (CNDDB 1983). CNDDB considers the following to be "communities of special concern": sycamore woodland (a riparian community), vernal pool (occurring within the valley grassland), and native perennial grassland (occurring within the valley grassland).

PLANT LIST

Common name	Scientific name
Blue oak	Quercus Douglasii
Bluegrass	Poa sp.
Brewer's hesperolinon	Hesperolinon Breweri
Brodiaea	Brodiaea sp.
Buckeye	Aesculus californicus
Bull thistle	Cirsium vulgare
Buttercup	Ranunculus sp.
California melic	Melica californica
Cattail	Typha sp.
Cockleburr	Xanthium sp.
Common buckbrush	Ceanothus sp.
Cottonwood	Populus sp.
Coulter pine	Pinus Coulteri
Diablo rock rose	Helianthella castanea
Digger pine	Pinus sabiniana
Downingia	Downingia sp.
Elderberry	Sambucus sp.
Fescue	Festuca sp.
Foxtail barley	Hordeum leporinum
Iodine brush	Allenrolfea occidentalis
Live oak	Quercus wislizenii
Lupine	Lupinus sp.
Manzanita	Arctostaphylos sp.
Nodding needle grass	Stipa cernua
Paintbrush	Castilleja sp.
Pepper grass	Lepidium sp.
Pickleweed	Salicornia virginica
Poison oak	Toxicodendron diversilobum
Poppy	Eschscholzia californica
Purple needle grass	Stipa pulchra
Purple owl's clover	Orthocarpus purpurensis
Rabbitfoot grass	Polypogon monspielensis
Red brome	Bromus rubens
Red-stemmed filaree	Erodium cicutarium
Ripgut brome	Bromus rigidus
Rush	Juncus sp.
Russian thistle	Salsola sp.
Ryegrass	Lolicum sp.
Saltgrass	Distichlis spicata
Sandwort	Arenaria sp.
Sedge	Carex sp.
Sunflower	Helianthus sp.
Sycamore	Platanus racemosa
Tamarisk	Tamarix sp.
Tree tobacco	Nicotiana glauca
Tule	Scirpus sp.
Valley oak	Quercus lobata
Walnut	Juglans sp.
Wildgrape	Vitis californica
Willow	Salix sp.

TABLE 3-30: HABITAT TYPES ALONG THE PROJECT ROUTE

HABITAT TYPE	LOCATION/OCCURANCE	CHARACTERISTIC PLANTS/STRUCTURE	CHARACTERISTIC WILDLIFE	MILES/PERCENT IN 400-FOOT ROW
VALLEY GRASSLAND	Valley floor, and also extends as an understory into low foothill communities.	Annual grasses: red brome, fescue, ripgut brome, foxtail barley; russian thistle, red-stemmed filaree. Many native wildflowers: e.g., poppy, buttercup, purple owl's clover, lupine, paintbrush. Occasional scattered common saltbrush.	Kitfox, coyote, badger, jackrabbit, ground squirrel, desert cotton-tail, Heermann's kangaroo rat; several mice species: pocket, gopher, deer, and meadow mouse; turkey vulture, black-shouldered kite, northern harrier, golden eagle, killdeer, barn owl, lesser night-hawk, yellow-billed magpie, burrowing owl, red tailed hawk, kingbird, meadowlark, mourning dove, kestrel; tiger salamander, California newt, western spadefoot, bullfrog, striped racer, western rattlesnake, gopher snake, western toad, coast horned lizard.	122.8/46.9%
		Vernal Pools - occur in hardpan depressions interspersed in the Valley Grassland. Salt downingia, pepper grass, sandwort, brodiaea.		
		Native Perennial Grassland - occurs on dry plains and low foothills of eastern slope Coast Range, interspersed in valley (annual) grassland. Purple needle grass, nodding needle grass, California melic.	See valley grassland above	
SALTBUSH SCRUB	Non-alkaline, sandy soils on valley floor, and on foothills between 2000 feet and valley; inner south Coast Range from Merced to Kern Co.	Common saltbrush/10%-100% cover. Understory of annual grasses and forbs (see Valley Grassland above).	See valley grassland above	29.2/11.2%

Continued

TABLE 3-30: HABITAT TYPES ALONG THE PROJECT ROUTE, continued

HABITAT TYPE	LOCATION	CHARACTERISTIC PLANTS/STRUCTURE	CHARACTERISTIC WILDLIFE	MILES/PERCENT IN 400-FOOT ROW
ALKALI SINK	Valley floor, undrained low-lying depressions.	Iodine brush, seepweed, common saltbrush, pickleweed. Grasses: saltgrass, annual fescue, red brome; red-stemmed filaree.	Coyote, kitfox, badger, jackrabbit; several mice species - brush, deer & pocket; kangaroo rats; side-blotched lizards, gopher snake kingsnake	7.4/ 2.8%
OAK SAVANNAH	Foothills east of Mt. Diablo.	Blue Oak/valley oak/live oak canopy closure 30% or less. Understory of annual grasses (see Valley Grassland above). Shrubs: common buckbrush, manzanita, coyote brush, poison oak.	Mule deer, western grey squirrel, compton flicker, white-breasted nuthatch, red-tailed hawk, acorn woodpecker, turkey vulture, scrubjay, king snake, gopher snake. (see also Valley Grassland above).	3.5/ 1.3%
FRESHWATER MARSH	Along irrigation ditches, ponds, areas of standing water.	Cattail, sedges, rushes, rabbitfoot grass, bull thistle, curly dock.	Herons, egrets, bitterns, grebes, geese, black-shouldered kite, red-tailed hawk, kestrel, swallows, blackbirds; several mice species - house, harvest & deer; coyote, striped-skunk; Pacific-tree frog, western bullfrog, common kingsnake.	1.8/ 0.7%
BRACKISH MARSH	Margins of Suisun Bay, along Pacheco Creek crossing.	Pickleweed, saltgrass, cattails, sedges, rabbitfoot grass.	Waterfowl, shorebirds, great horned owl belted kingfisher, swallows, red-winged blackbird.	0.2/ 0.1%
RIPARIAN HABITAT	Streamside corridor	Woodland: cottonwood, sycamore, willows. Understory-grasses, shrubs: Weedy pioneer species of annual grasses, thistles.	Coyote, kit fox skunk, beechy ground squirrel; killdeer, red-tailed hawk, great-blue heron, morning dove, northern oriole, woodpeckers, house finch's, hummingbirds.	1.2/ 0.5%
DISTURBED (e.g., oil production, abandoned crop-land)	Primarily on valley floor.	Weedy species (e.g., russian thistle, annual grasses and forbs)	Occasional use by: San Joaquin kit fox, blunt-nosed leopard lizard, coyote.	18.4/ 7/0%
CULTIVATED			Coyote; nighthawks, red-tailed hawks, beechy ground-squirrels.	77.3/29.5%

SOURCE: Compiled by Environmental Science Associates based on CDFG Wildlife Habitats Relationships model

In addition, riparian associations, wetlands, and large oaks of the savannah woodland are considered to be limited but important resources of concern. A brief description of these sensitive biological resources follows.

Vernal Pools. Vernal pools occur in hardpan depressions interspersed in the valley grassland. These pools fill with water in the winter, and as they dry up in the spring, various annual plant species flower, often in conspicuous concentric rings. These "island" habitats host unique native plant associations with a high degree of endemism. Twisselmann (1967) identified two distinct plant associations within the vernal pools of Kern County; those of the Temblor and of the San Emigdio ranges, both of which may occur in the project area. Vernal pools also occur in proximity to the pipeline route in Contra Costa County. Two vernal pools were documented in the field survey (MP 227.2, MP 227.5)

The delta green ground beetle, a federally listed insect species, is associated with vernal pools and is known to occur in Sacramento and Solano Counties (M. Marangio, personal communication).

Native Perennial Grassland. Remnant native perennial grassland communities can be found on the dry valley plains and eastern base of the Coastal Ranges up to 500 feet elevation. Dominant species are: purple needle grass, nodding needle grass, and California melic. One stand of native grasses is known to occur in southern Contra Costa County in the project vicinity; others may occur in areas that are inaccessible to livestock. No native perennial grasses are present in the pipeline corridor.

Riparian Habitat. Streamside vegetation may vary from herbaceous cover of grasses and shrubs to multi-layered woodland. Field surveys, conducted during the summer of 1986, revealed 17 riparian habitat areas, 11 of minimal value, totaling approximately 1.5 miles of riparian habitat along the proposed pipeline route. This represents approximately 0.5% of the total miles traversed. The areas of minimal value are characterized by cattle "cropped" vegetation with little or no water present, and are in alignment with previously disturbed pipeline and power transmission corridors or have been degraded by intensive grading, vehicle use, or mining. The historic Central Valley floodplain forests have been largely destroyed by agricultural clearing and flood control activities. Nonetheless, the riparian areas serve as an oasis for animal life during the summer. Water in the arid western valley region is a critical resource for wildlife, such as the special-status species known to occur in the project region (e.g., tiger salamander, red legged frog, and San Joaquin kit fox). Existing riparian areas in the region, in particular, represent a sensitive wildlife habitat that supports a broad variety of species. Important creek crossings with riparian vegetation and wildlife use observed are listed in Table 3-31.

South of Merced County, the pipeline crosses two creeks mapped as perennial by the USGS: Los Gatos Creek and one unnamed creek. During the summer field survey, there was no flow in either of the perennial creeks. Los Gatos Creek supports very sparse riparian vegetation,

TABLE 3-31: IMPORTANT STREAM CROSSINGS

Stream	Milepost	Stream Width at ROW	Water Present (Yes or No)	Stream Rating/a/	Dominant Vegetation	Aquatic Organisms Observed	Wildlife Observed	Signs of Disturbance
Los Gatos Creek	79	1,000'	N	P	Salt cedar, cottonwood, saltbush, thistle, sunflower, grasses	None	Doves, lizard, jackrabbit, cottontails, coyote	Agriculture, highway, ORV use
Panoche Creek	122.5	25'	N	I	Saltbush, tamarisk, grasses	None	Jackrabbit, barn owl, lizard	Agriculture, garbage, ORV use
Little Panoche Creek	135.5	20'	N (Dam controlled)	I	Saltbush, grasses, cattail	Tree frog, snail	Beechy ground squirrel, jackrabbit	Grazing, paved road ORV use
Ortigalita Creek #1	147.3	15'	N	I	Grass, sedges	None	None	Grazing
Ortigalita Creek #2	147.8	20'	N	I	Grasses	None	None	Grazing, road
Ortigalita Creek #3	148.3	35'	Y	I	Sedges, duckweed	Mosquitofish, insects (Odonata)	Beechy ground squirrels	Grazing
Salt Creek	151.2	2'-10'	Y	I	None	Backswimmers	None	Plowing, grazing
Quinto Creek	168.4	25'	Y	I	Cottonwood, willow cattails	Bullfrogs, mosquitofish, gerridae	Magpies	Grazing, agriculture
Garzas Creek	174.8	200'	Y (pooled)	I	Willow, cottonwood, cattail, sedge, sunflower	Mosquitofish, crayfish	Western toad, house finch	None
Orestimba	179.6-179.8	200'	Y (pooled)	I	Sycamore, willow, saltgrass, bluegrass, lovegrass	Mosquitofish tadpoles, Gerridae	Red-tailed hawk Odonata, magpies, hummingbirds, N. flicker, great blue heron, beechy ground squirrel	Grazing
Crow Creek	183.5	25'	Y	I	Saltgrass, sedge, sunflower	Mosquitofish, Gerridae	Odonata, hummingbirds	Grazing
Del-Puerto Canyon	192.5	50'	Y	I	Tree tobacco, willow, saltbush, saltgrass, sunflower	Mosquitofish	Kingbirds, killdeer	Grazing

(continued)

TABLE 3-31: IMPORTANT STREAM CROSSINGS (Continued)

Stream	Milepost	Stream Width at ROW	Water Present (Yes or No)	Stream Rating/a/	Dominant Vegetation	Aquatic Organisms Observed	Wildlife Observed	Signs of Disturbance
Unnamed	222.8	20'-30'	Y	I	Cattail, grasses	None	None	Pumping plant, grazing
Kellogg Creek	231.8	125'	N	I	Cockleburr, sedge, tule	None	None	Grazing
Marsh Creek	233.7	50-75'	Y	P	Cottonwood, willow, sycamore, valley oak, walnut, buckeye, elderberry wild grapes, mugwort, cockleburr, grass, sedge, ryegrass	Gerridae	Beaver, fence lizard, hawk, crow, Black Pheobe, Anna Hummingbird, Northern Oriole, Nuttall's Wood-pecker, Scrub Jay, California Quail	Agriculture
Unnamed	242-243	20'	Y	P	Sedge, cattail, willow, watercress, cottonwood	Hyla regillas (Pacific tree frog)	Fence lizard, Black Pheobe, Western Kingbird	Grazing, road
Pacheco	255.4	300'	Y	P	Sedge, cattail, rush, saltgrass, picklweed, rabbitfoot grass	None	Frogs, great blue heron, egret	Industrial development, road, railroad.

/a/ P = Perennial; I = Intermittent. As defined by USGS 7.5 minute topographic maps.

SOURCE: Environmental Science Associates, Inc.

with salt cedar and a few cottonwoods along the banks. Terrestrial wildlife use of the creek area includes mourning doves, side-blotched lizards, black-tailed jackrabbits, desert cottontails, and coyotes. The unnamed perennial creek crossed at MP 89.3 is also a drywash, situated in a grazed grassland area that does not support riparian vegetation or unique wildlife.

Two of the larger, intermittent creeks are Panoche and Little Panoche creeks. Panoche Creek at the crossing has some saltbush and tamarisk shrub cover, with an understory of annual grasses and "volunteer" wheat from the nearby agricultural lands. The creek is very disturbed, with ORV and bulldozer tracks in the bed, as well as evidence of garbage dumping and sheep grazing. Wildlife use observed at Panoche Creek includes barn owl, black-tailed jackrabbit, and side-blotched lizard. Little Panoche Creek at the pipeline crossing is controlled by the dam of Little Panoche Detention Basin, approximately 1 mile upstream. Saltbush grows on the drier edges of the creek bed, with cattails and rushes. Aquatic snails occur instream with terrestrial wildlife including beechy ground squirrels, blacktailed jackrabbits, and small rodents (probable Dipodomys). Sheep are grazed in and around the creek, and there is evidence of ORV and dirt bike use of the creek bed.

The remainder of the creek crossings in the southern portion of the valley are all of small intermittent creeks characterized as dry washes which support little, if any, riparian vegetation.

North of the Fresno/Merced county line, four high-value riparian habitat areas will be crossed by the proposed project at Marsh Creek, Garzas Creek, Pacheco Creek, and Orestimba Creek. These high-value riparian areas are characterized by vegetation that is now uncommon to the Central Valley region. Marsh Creek supports stands of cottonwood and willows, sycamore valley oak, and elderbery, with diverse understory vegetation and water present. Terrestrial wildlife such as red-shouldered haute, black phoebe, Anna's hummingbird, northern oriole, and Nuttall's woodpecker potentially use the habitat at the crossings. Garzas Creek has willow and cottonwood on its banks, with limited wildlife use. Neither of the creeks are grazed and disturbance is minimal.

The Pacheco Creek crossing represents a different type of riparian habitat; it is a brackish marsh influenced by Suisun Bay (see discussion under wetlands, below). Cattails, sedges, pickleweed, saltgrass, and rabbitfoot grass predominate. The area is utilized by aquatic and terrestrial wildlife species.

Sycamore woodland has been identified as a plant community of concern (CNDDB). Sycamore woodland occurs along Orestimba Creek in Stanislaus County. This community is dominated by an overstory of sycamore with various woody and herbaceous components in the understory. The proposed crossing at Orestimba Creek is already affected by the existing pipeline and powerline corridor, cattle grazing, and the flood that occurred in the winter of 1986. High water in 1986 caused localized flooding and the relocation of the channel, which has since been bulldozed to return the flow to its original configuration. As a result, little vegetation remains along the creek. Despite the impacts of grazing, and creekbed degradation, the riparian habitat at Orestimba Creek is still a high-value area. Wildlife use includes diverse birds and mammals, with some aquatic life in the pooled areas (see Aquatic Biology section).

Two crossings are in riparian habitats of moderate value: Quinto Creek and the unnamed crossing at MP 242-243. These habitats are characterized by sparse cottonwoods, with understory vegetation, but also receive pressure from grazing and agriculture. The pipeline also crosses several riparian areas created by the draining of an impoundment in the managed O'Neill Forebay Wildlife Area (CDFG). The drainage channels support edge-rows of cottonwoods and willows that create riparian habitats.

Wetlands. Freshwater marsh habitat occurs sporadically throughout the project area along the margins of irrigation ditches, low-lying irrigation return ponds, and other areas of standing water. Small wetland areas are encountered along the pipeline route, as well as a larger wetland area caused by a breech of an irrigation canal (MP 40-41). The wetland is characterized by tamarisks and willows, with a cattail and rush understory. Aquatic and terrestrial organisms use the area. The O'Neill Forebay Wildlife Area (MP 161.3) also includes wetland areas. The pipeline crosses through grassland adjacent to the wetland areas in the Forebay.

Brackish marshes occur along the margins of San Francisco Bay in both tidal and diked situations. Within the project area, brackish marsh is present along Pacheco Creek (MP 255.4). Characteristic vegetation includes cattails, sedges, pickleweed, saltgrass, and rabbitfoot grass. Fill and development of the bay margins has substantially reduced marsh habitat in the Bay Area. The remaining marsh areas support extensive bird populations and may provide habitat for the salt marsh harvest mouse, the California clapper rail, and the California black rail. The salt marsh harvest mouse is known to occur in marshes less that one-half mile from the project corridor (CNDDB 1985). No known occurrences of the clapper rail near the corridor are listed and no rails were sited during the 1986 survey. The nearest known siting of a black rail is over a mile from the corridor and no black rails were sited during the survey.

Oak Savannah. Oak trees dominate community life in the oak savannah areas traversed by the pipeline route, from MP 239-253. The oaks serve as observation posts for hawks, turkey vultures, and other predators, and provide a tree canopy and cavities for nesting. They are rich food sources for acorn-eaters such as acorn woodpeckers, magpies, scrub jays, mule deer, and ground squirrels, and support immense insect populations. Lewis' woodpecker, western bluebirds, rufous-sided towhees, mourning doves, titmice, and black-headed grosbeaks are among the wildlife species supported by oak savannah. The oak savannah area traversed by the proposed pipeline route is heavily grazed.

Unique and Managed Areas

A number of distinctive areas within or near the project area are known and/or managed for their biological/and related recreational values. They are briefly described below and listed in Table 3-32.

The Lost Hills Natural Area in Kern County has been designated as a privately owned area of biological interest. This area, which runs adjacent to the proposed pipeline between MP 28 and 34, contains remnants of once extensive riparian, marsh, and alkaline play a communities. Two rare plants, slough thistle and San Joaquin saltbush, are found in the area, as well as the San Joaquin kit fox and the blunt- nosed leopard lizard.

The Kettleman Hills Natural Area is a grassland and scrub area in private ownership and management. The proposed pipeline would run along the area between MP 59 and 72 on the east side of Interstate 5 in Fresno County. The blunt-nosed leopard lizard and San Joaquin kit fox occur, along with San Joaquin saltbush.

The Little Panoche Wildlife Area in Fresno County lies within 1 mile of the proposed pipeline at MP 13. Designated as a California Natural Area, it contains a reservoir that attracts game birds such as the native California quail and the introduced chukar. The site is also used by waterfowl during the winter migratory season and is managed for hunting by the CDFG.

Byron Hot Springs in Contra Costa County is a privately owned property that is designated as a California Natural Area. The area contains a number of scattered hot mineral springs and alkali mud flats. A rare snail (not listed), Helminthoglypta contracostae, is found at this location. The pipeline would pass within 1 mile of Byron Hot Springs near MP 229.

Nortonville Coulter Pine Groves Natural Area is located to the west of the proposed pipeline between MP 242 and 245 in Contra Costa County. Part of the area is owned and managed by the East Bay Regional Park District as the Black Diamond Mines Park. A distinct pine woodland characterized by Coulter pine and digger pine is found here, along with a number of rare plants such as Diablo rock rose and Brewer's hesperolinon.

The Tule Elk Reserve Natural Area is located in the Concord Naval Weapons Station near MP 215 in Contra Costa County. The proposed pipeline would pass within 1 mile of a corner of the reserve. The area is fenced and is being managed by the United States Navy to protect the tule elk (Cervus nannodes) herd which was brought to the reserve in 1977.

O'Neill Forebay Wildlife Area is located between MP 161.3 and 163.7 in Merced County: the project would pass directly through the wildlife area. O'Neill Forebay was established as mitigation for the construction of O'Neill Reservoir. A series of on-grade ditches and ponds have created riparian habitat. Large stands of cottonwood and

TABLE 3-32: UNIQUE AND MANAGED AREAS

Managed Area	Milepost	County	Distance from ROW	Feature
Lost Hills Natural Area	28-34	Kern	1 mile	Riparian, marsh and alkaline playa communities
Kettleman Hills Natural Area	59-72	Fresno	.9 mile	BNLL/1/, SJKF/2/ habitat San Joaquin saltbush
Little Panoche Wildlife Area	13	Fresno	1 mile	Reservoir -- game birds, hunting
Byron Hot Springs Natural Area	229	Contra Costa	1 mile	Mineral springs, alkali mud flats. Rare snail habitat.
Contra Loma Regional Park	241	Contra Costa	0	Reservoir - swimming
Nortonville Coulter Pine Groves Natural Area (Black Diamond Mines Park)	242-245	Contra Costa	1 mile	Pine Woodland
Tule Elk Reserve Natural Area	253	Contra Costa	.8 mile	Tule elk herd
O'Neil Forebay Wildlife Area	161.3-163.7	Merced	0	Riparian habitat

/1/ Blunt nose leopard lizard
/2/ San Joaquin kit fox

SOURCE: Environmental Science Associates

willow trees are found on the site. The wildlife area is open to the public for hunting and nature study. Grain is grown on the site to provide seeds for doves, pheasants, and other birds.

Special Status Plant and Animal Species

The state and federal listed and candidate plant and animal species potentially occurring within the project area are presented in Tables 3-33, 3-34, 3-35, and 3-36. In addition, Table 3-37 presents these species by habitat along the project route. Known occurrences of these species are identified on the maps included as Figures 3-5 through 3-13 at the end of this section. Each state and federal listed species is briefly described below. No listed species were located within the project area during the 1986 field survey. Further botanical studies will be conducted in 1987.

Plants-Listed Species

Palmate-bracted bird's beak (Cordylanthus palmatus). Listed as endangered by USFWS and CDFG. Habitat is generally confined to alkali soils of lowland flats and plains. The sites are typically wet during winter and spring months, and are found within grassland habitat. Historically known from seven scattered locations in Fresno, Madera, San Joaquin, Yolo and Colusa counties; recent observations have extended its known range to Alameda County. At present, only three sites are known: two are in private and city-owned lands near the cities of Livermore in Alameda County, and Woodland in Yolo County, and the third, a transplanted colony, is within the Mendota State Wildlife Area near Mendota, Fresno County [U.S. Department of the Interior (USDI) 1985]. The rarity of the saline-alkaline soils occupied by the species and the intensive agricultural and urban development within its range make the likelihood of finding additional colonies remote (USDI 1985).

Soft bird's beak (Cordylanthus mollis subsp. mollis). Listed as a Candidate 2 species by the USFWS and as rare by CDFG, it occurs in salt marsh habitats of Contra Costa County.

Giant fiddleneck (Amsinckia grandifora). Listed as proposed endangered by the USFWS and classified as endangered by CDFG. It is presently restricted to only one site, Site 300, Lawrence Livermore National Laboratories, San Joaquin County, California, 1 mile north of Corral Hollow Road. The population at Site 300 fluctuates with the amount of annual precipitation. Numbers are known to fluctuate from several thousand to no plants. Marginal soil conditions and areas of restricted grazing may be especially suitable for growth of the large-flowered fiddleneck.

Colusa grass (Neostapfia colusana). Listed as Candidate 2 by USFWS and as endangered by CDFG. It is found in large or deep vernal pool bottoms, commonly in pure stands, in Stanislaus, Merced, and Solano counties.

Mason's lilaeopsis (Lilaeopsis masonii). Listed as a USFWS Candidate 2 species and as rare by CDFG. The plant occurs on the

TABLE 3-33: FEDERAL AND STATE LISTED PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE PROJECT VICINITY

Common Name	Scientific Name	Status: State (CDFG)	Status: Federal (USFWS)	Status: CNPS	Flowering Period	Habitat	Known Distribution
Giant fiddleneck	Amsinckia grandiflora	CE	PE	3-3-3 List 1	April-May	Valley grassland	Contra Costa County San Jose (1:250K T1N/R1E)
Palmate-bracted bird's beak	Cordylanthus palmatus	CE	E	3-3-3 List 1	June-October	Valley grassland	San Joaquin and Sacramento Valley
Soft bird's beak	Cordylanthus mollis subsp. mollis	CR	C2	2-2-3 List 1	July-November	Brackish marsh	Contra Costa County
Delta coyote-thistle	Eryngium racemosum	CE	C1	3-3-3 List 1	June-September	Valley grassland	Historically known from San Joaquin Delta Region; recently known from a single population in Calaveras County.
Mason's lilaeopsis	Lilaeopsis masonii	CR	C2	2-2-3 List 1	April-July	Brackish marsh	Sacramento/San Joaquin Delta region
Colusa grass	Neostapfia colusana	CE	C2	3-3-3 List 1	May-July	Valley grassland	Stanislaus and Merced Counties
Crampton's tuctoria	Tuctoria mucronata	CE	PE	3-3-3 List 1	April-July	Vernal Pool	Sacramento and San Joaquin Valleys

Key to Table 3-33 on page .

TABLE 3-34: FEDERAL AND STATE CANDIDATE PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE PROJECT VICINITY

Common Name	Scientific Name	Status: State (CDFG)	Status: Federal (USFWS)	Status: CNPS	Flowering Period	Habitat	Known Distribution
Furcate fiddleneck	*Amsinckia furcata*	NL	C2	1-2-3 List 1	March-May	Valley grassland; dry grassy plains and slopes	Fresno County
Suisun aster	*Aster chilensis* var. *lentus*	NL	C2	2-2-3 List 1	June-November	Brackish marsh; tidal sloughs and marshes	Sloughs and marshes in Contra Costa County
San Joaquin saltbush	*Atriplex patula* subsp. *spicata*	NL	C2	--	June-October	Alkali sink; periphery of alkaline playas	Throughout San Joaquin Valley
Bakersfield saltbush	*Atriplex tularensis*	NL	C1	3-3-3 List 1	June-October	Alkali sink; periphery of alkaline playas	Kern County
Lost Hills saltbush	*Atriplex vallicola*	NL	C2	2-2-3 List 1	June-October	Alkali sink; periphery of alkaline playas	Kern, Kings and Fresno Counties
California jewelflower	*Caulanthus californicus*	NL	**C2	?-?-3 List 3	March-April	Valley grassland; grassland below 3,000 feet	Throughout San Joaquin Valley
Slough thistle	*Cirsium crassicaule*	NL	C2	2-2-3 List 1	June-August	Freshwater marsh; streambanks, washes, sloughs or canals,	Northwest Kern and adjacent Kings Counties Counties

continued

TABLE 3-34: FEDERAL AND STATE CANDIDATE PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE PROJECT VICINITY (Continued)

Common Name	Scientific Name	Status			Flowering Period	Habitat	Known Distribution
		State (CDFG)	Federal (USFWS)	CNPS			
Hispid bird's beak	Cordylanthus mollis subsp. hispidus	NL	C2	2-2-3 List 1	June-July	Valley grassland; alkaline soils	Merced and Kern Counties; extirpated from southern San Joaquin Valley
Congdon's eatonella	Eatonella congdonii	NL	**C2	1-1-3 List 4	March-April	Alkali sinks; valley grassland	San Joaquin Valley from Fresno County to Kern County
Kern mallow	Eremalche kernensis	NL	C2	2-3-3 List 1	April-May	Saltbush scrub	Temblor Valley near McKittrick in Kern Co.
Hoover's wooly-star	Eriastrum Hooveri	NL	**C2	1-1-3 List 4	April-June	Valley grassland sites;	Approximately 12 known Fresno County to Kern County
Delta tule-pea	Lathyrus jepsonii subsp. jepsonii	NL	C2	2-2-3	May-June	Brackish marsh	Suisun marshes, southern San Francisco Bay
Bearded allocarya	Plagiobothrys hystriculus	NL	C2	3-3-3 List 1	April-May	Valley grassland	Merced County
Caper-fruited tropidocarpum	Tropidocarpum capparideum	NL	C2	3-1-3 List 1	March-April	Valley grassland; alkaline soils	Contra Costa, Alameda Western San Joaquin Counties

Key to Table 3-34 on following page.

KEY TO TABLES 3-33 and 3-34

STATE LISTED PLANTS

CE = State listed, endangered
CR = State listed, rare
CT = State listed, threatened
NL = No listing; CNDDB Species of Concern

FEDERAL CANDIDATES AND FEDERALLY LISTED PLANTS

FE = Federally listed, endangered
FT = Federally listed, threatened
C1 = Candidate, enough data are on file to support the federal listing
C2 = Candidate, Information now available indicates that listing may be appropriate but supporting data are not currently on file
**C2 = Candidate, status likely to be elevated from candidate to threatened on endangered.

CNPS R-E-D CODE/LIST

R (Rarity)

1 = rare, but found in sufficient numbers and distributed widely enough that the potential for extinction or extirpation is low at this time.
2 = occurrence confined to several populations or to one extended population.
3 = occurrence limited to one or a few highly restricted populations, or present in such small numbers that it is seldom reported.

E (Endangerment)

1 = not endangered
2 = endangered in a portion of its range
3 = endangered throughout its range

D (Distribution)

1 = more or less widespread outside California
2 = rare outside California
3 = endemic to California

List 1: A) plants presumed extinct in California; B) plants are rare and endangered in California and elsewhere
List 2: plants rare and endangered in California, but more common elsewhere
List 3: plants about which more information is needed
List 4: plants of limit distribution (a "watch" list)

SOURCE: Compiled by Environmental Science Associates

TABLE 3-35: FEDERAL AND STATE LISTED WILDLIFE SPECIES POTENTIALLY OCCURRING WITHIN THE PROJECT VICINITY

Common Name	Scientific Name	Status: State (CDFG)	Status: Federal (USFWS)	Habitat	Distribution
San Joaquin antelope squirrel	Ammospermophilus nelsoni	CT	C2	Valley grassland, saltbush scrub, alkali sink; level/gently sloping land, sandy loam soils, sparse vegetation	Tulare Basin, San Joaquin Valley
Giant kangaroo rat	Dipodomys ingens	CE	PE	Valley grassland, alkali sink; saltbush scrub, disturbed areas; level/gently sloping land; sandy loam soils; sparse vegetation	Tulare Basin, San Joaquin Valley; western side of valley; Merced to Kern County
Blunt-nosed leopard lizard	Gambelia silus	CE	FE	Valley grassland, alkali sink, saltbush scrub, disturbed areas; sparse vegetation	Tulare and Kern Counties, eastern Coast Range foothills; Carrizo Plain
Peregrine falcon	Falco Peregrinus	CE	FE	Riparian, alkali sink, freshwater marsh	Throughout California
California clapper rail	Rallus longirostris obsoletus	CE	FE	Brackish marsh; tidal/non tidal	South San Francisco Bay; Napa marshes; San Pablo Bay
Salt marsh harvest mouse	Reithrodontomys raviventris	CE	FE	Brackish marsh; tidal/non tidal	San Francisco Bay marshes
San Joaquin kit fox	Vulpes macrotis mutica	CT	FE	Oak savannah, valley grassland, alkali sink, saltbush scrub, slopes less than 30%	Tehachapi foothills, foothills of western San Joaquin Valley to Byron, Contra Costa County
California black rail	Laterallus jamaicensis	CT	C2	Brackish marsh	San Francisco Bay

Key to Table 3-35 on page .

TABLE 3-36: FEDERAL AND STATE CANDIDATE WILDLIFE SPECIES POTENTIALLY OCCURRING WITHIN THE PROJECT VICINITY

Common Name	Scientific Name	Status State (CDFG)	Status Federal (USFWS)	Habitat	Distribution
California tiger salamander	Ambystoma tigrinum californiense	NL	C2	Freshwater marsh; riparian	Sacramento and San Joaquin Valleys
Tipton kangaroo rat	Dipodomys n. nitratoides	NL	C2	Alkaline sink	Tulare Basin, San Joaquin Valley
Short-nosed kangaroo rat	Dipodomys nitratoides brevinasus	NL	C2	Valley grassland, alkali sink	Western San Joaquin Valley
Alameda striped racer	Masticophis lateralis euryxanthus	NL	C2	Valley grassland, oak savannah	Valleys to low mountains, Coast Range east of San Francisco Bay and west of Central Valley in Contra Costa or Alameda Counties.
San Joaquin pocket mouse	Perognathus l. inornatus	NL	C2	Valley grassland, oak savannah, alkalai sink	Tulare Basin, San Joaquin Valley, Sacramento Valley Panoche Valley

KEY TO TABLES 3-35 AND 3-36

STATE LISTED ANIMALS

CE = State listed, endangered
CT = State listed, threatened
NL = No listing; CNDDB Species of Concern

FEDERAL CANDIDATES AND FEDERALLY LISTED ANIMALS

FE = Federally listed, endangered
FT = Federally listed, threatened
PE = Proposed endangered
C1 = Candidate, enough data are on file to support the federal listing
C2 = Candidate, threat and/or distribution data are insufficient to support federal listing
**C2 = Candidate, status likely to be elevated from candidate to threatened on endangered

SOURCE: Compiled by Environmental Science Associates, 1986

TABLE 3-37: POTENTIAL OCCURANCE OF LISTED SPECIES (CDFG/USFWS) BY HABITAT

HABITAT	PLANT SPECIES	LISTING	ANIMAL SPECIES	LISTING
VALLEY GRASSLAND	- *Cordylanthus Palmatus*	USFWS	- San Joaquin kit fox	USFWS,CDFG
	- *Tuctoria mucronata*	USFWS, CDFG	- Blunt-nosed leopard lizard	USFWS,CDFG
	- *Amsinckia grandiflora*	CDFG	- Giant kangaroo rat	USFWS,CDFG
	- *Eryngium racemosum*	CDFG	- San Joaquin antelope squirrel	CDFG
	- *Neostafia colusana*	CDFG		
SALTBUSH SCRUB	None		- San Joaquin kit fox	USFWS,CDFG
			- Blunt-nosed leopard lizard	USFWS,CDFG
			- Giant kangaroo rat	USFWS,CDFG
			- San Joaquin antelope squirrel	CDFG
ALKALI SINK	NONE		- San Joaquin kit fox	USFWS,CDFG
			- Blunt-nosed leopard lizard	USFWS,CDFG
			- Giant kangaroo rat	USFWS,CDFG
FRESHWATER MARSH	NONE		- California clapper rail	USFWS,CDFG
			-Peregrine falcon	USFWS,CDFG
RIPARIAN			- Peregrine falcon	USFWS,CDFG
OAK SAVANNAH	See VALLEY GRASSLAND		- San Joaquin kit fox	USFWS,CDFG
BRACKISH MARSH	- *Cordylanthus mollis* subsp. *mollis*		- Salt marsh harvest mouse	USFWS,CDFG
	- *Lilaeopsis masonii*		- California clapper rail	USFWS,CDFG
			- Black rail	
DISTURBED	SEE VALLEY GRASSLAND		- Blunt-nosed leopard lizard	USFWS,CDFG
			- Giant kangaroo rat	USFWS,CDFG
			- San Joaquin Kit fox	USFWS,CDFG

SOURCE: Environmental Science Associates

margins of the Sacramento-San Joaquin delta. Potential habitat along the project route for Mason's lilaeopsis may occur at MP 257.2.

Orcutt's grass (Tuctoria mucronata). Listed as Endangered by USFWS and CDFG. It is a yellow-green annual grass that flowers from May to July. The species occurs in white-alkaline vernal pools. At present T. mucronata is known from a single location in Solano county. Potential habitat for T. mucronata occurs along the project alignment near MP 227.2.

Plants - Candidate Species

A number of candidate plant species have the potential to occur in the project area (see Table 3-34). No candidate plant species were located during 1986 field surveys. Further botanical studies will be conducted in 1987, following certification of the Final EIR/EIS but in advance of final pipeline design.

Wildlife - Listed Species

San Joaquin kit fox (Vulpes macrotis). Listed as Endangered by USFWS and Threatened by CDFG. Originally it was a relatively common carnivore of the semi-arid habitats of the San Joaquin Valley from San Joaquin and Stanislaus counties south to Kern County (Grinnell et al. 1937). Starting in the early 1900s, agricultural, industrial, and urban developments brought about rapidly increasing rates of habitat loss that eventually led to population declines. Three areas with exceptionally high San Joaquin kit fox population densities (nearly four foxes per square mile) have recently been identified: the Elk Hills Naval Petroleum Reserve in Kern County (O'Farrell 1980), the Elkhorn Plains in San Luis Obispo County (O'Farrell and McCue 1981), and Camp Roberts on the Monterey/San Luis Obispo county line (Balestreri 1981). Dens are usually found in loose-textured soils in the southern portion of their range and in harder clay soils in the northern part of their range (Biotech 1983; Hall 1983). Studies on the Naval Petroleum Reserve #2 (Elk Hills) indicate that the kit fox is adaptable to denning in man-made structures. The 1986 corridor survey identified 38 potential kit fox den systems. Three of the den systems located between MP 3.7 and 16.2 appeared to be natal dens. The highest density of den systems/mile occurred in the saltbush scrub habitats (0.41/mile), followed by the valley grassland (0.16/mile), cultivated habitats (0.08/mile), and disturbed habitats (0.06/mile). Approximately 75% (N=29) of the den systems were located between MP 2.4 and 16.9. In addition, two kit foxes were observed along the pipeline corridor during spotlight surveys at MP 4.5 (Telegraph Hills area) and MP 41.5 (alkali sink area north of Mid station).

Blunt-nosed leopard lizard (Gambelia silus). Listed as Endangered by USFWS and CDFG, the lizard once ranged through the San Joaquin Valley at least to Modesto and perhaps San Joaquin County (Montanucci 1965). This species is now confined to natural habitats on the valley floor in Kern, Tulare, Fresno, Madera, and Merced counties, in portions of the inner Coastal Ranges of San Luis Obispo and Monterey counties, and the Upper Cuyama River Valley. The type of soil inhabited varies from gravel to hardpan or sandy loam. Abandoned or occupied burrows of kangaroo rats and abandoned squirrel burrows are utilized for permanent shelter. Preferred habitat for the blunt-nosed leopard lizard are ecotonal areas comprised primarily of grasses interspersed with shrubby vegetation in flat and low foothill areas. One possible blunt-nosed leopard lizard observation was made in saltbush scrub habitat at MP 17.7. In addition, a carcass was located in a California ground squirrel colony at MP 107.9. The route crosses sections of blunt-nosed leopard lizard essential habitat (Brode et al. 1976), particularly in Kern and Kings counties.

Giant kangaroo rat (Dipodomys ingens). Listed as proposed Endangered by USFWS and as Endangered by CDFG, the species presently occupies about 2 to 3% of its historic range. Only five small areas, totaling about 12 square miles, support healthy populations. Habitat for the giant kangaroo rat consists of areas with friable soils, and exceedingly sparse vegetation and low amounts of precipitation. The giant kangaroo rat is most commonly found in open, usually flat ground, gently sloping plains, and higher level or hummocky ground (Grinnell 1932). No giant kangaroo rats were observed during the field survey. Survey results indicate that habitats traversed by the project are not optimal for the giant kangaroo rat.

Salt marsh harvest mouse (Reithrodontomys raviventris). Listed as Endangered by both USFWS and CDFG, the salt marsh harvest mouse is restricted to salt marsh habitats (Fisher 1965). Pickleweed (Salicornia sp.) is the dominant plant species associated with salt marshes where this species has been found (Fisher 1965; Shellhammer 1977), and has been considered a necessary component of optimal habitat (Wondolleck, Zoland, and Stevens 1976). However, areas dominated by fat hen (Atriplex patula) and other salt marsh species may also be used (Rice 1974; Botti, Warenucia, and Becker 1986). This species is endemic to the marshes of San Francisco and San Pablo bays and their brackish tributaries. The marshland habitat which once completely surrounded the bay has now been greatly reduced by human activities. Dikes and landfill have restricted the habitat to isolated pockets. Documented occurrences exist within 1,100 feet of the proposed route at the Pacheco Creek crossing. This area supports salt marsh vegetation that is characteristic of optimal harvest mouse habitat. No salt marsh harvest mice were observed during the field survey, but the potential for occurrences within the corridor exists.

California clapper rail (Rallus longirostris obsoletus). Listed as a USFWS and CDFG Endangered bird, it inhabits estuarine tidal salt and brackish marshes in the San Francisco Bay area. The bird nests in cordgrass, glasswort, or at the base of gumweed plants. It is a poor flyer and has a small home range. Clapper rails were not observed in the brackish marsh habitat along Pacheco Creek (MP 256.5) or any of the freshwater marsh habitats along the proposed alignment. They are not known to occur within the corridor, though marginal habitat exists.

California black rail (laterallus jamaicencis). Listed as Candidate 2 by USFWS and Threatened by CDFG. The California black rail occurs in pickleweed salt marshes and less frequently in freshwater bulrush marshes. Historically, it occurred in limited numbers from Tomalas Bay in Marin County south to northern Baja California and in inland freshwater marshes. The small, secretive bird is rarely seen and its current distribution and population size are not fully known. It has been observed in the San Joaquin Delta marshes, Suisun Marsh, San Pablo Bay marshes, and in the South San Francisco Bay, Alameda County. Destruction of coastal and inland wetlands by filling and draining threatens habitat vital to its existence.

Peregrine falcon (Falco peregrinus). Listed as Endangered by both USFWS and CDFG. This species requires cliffs for nesting and perching close to lakes or rivers. It is predaceous, feeding on birds such as band-tailed pigeons, woodpeckers, and jays. It breeds from early March through late August, with a peak from early May to late June. Its habitats range from annual grassland through lodgepole pine. There are few known nesting sites. During migration, individuals have been observed in a variety of habitats. Peregrine falcons were not observed nesting or foraging during the field survey. Peregrine falcons could potentially occur in all habitats along the pipeline route, particularly in the freshwater marsh and coastal salt marsh habitats.

San Joaquin antelope squirrel (Ammospermophilus nelsoni). Classified as Candidate 2 by USFWS and Threatened by CDFG, this desert ground squirrel is characteristic of desert wash, alkali sink, and creosote bush shrub areas, where it is found mostly on rocky or gravelly soil (Ingles 1965). It digs burrows under dense brush clumps or next to boulders. It also nests in old kangaroo rat burrows (S. Lowe, personal communication). The squirrels appear to require shrubs or other cover (D. Williams, personal communication). The Nelson's antelope squirrel (referred to as the San Joaquin antelope squirrel in CDFG 1980) historically inhabited dry, sparsely vegetated, loamy soil on the western side of the San Joaquin Valley, from southern Merced County south to Kern and Tulare counties, including portions of the Carrizo Plain in San Luis Obispo County and the Cuyama Valley in San Luis Obispo and Santa Barbara counties. It is estimated that about 20% of the original range is still occupied by Nelson's antelope squirrels; moderate densities of three to ten squirrels per hectare (2.5 acres) were found during a survey of about 41,000 hectare (102,500 acres) (CDFG 1980).

AQUATIC BIOLOGY

The preferred project alignment crosses a number of named and unnamed natural creek channels as well as channelized water distribution facilities (e.g., canals and aqueducts). The natural and man-made watercourses crossed by the project are listed in Table 3-13 and described in Section 3.2.4. Riparian habitats are described above under Biological Communities of Concern. This section provides an overview of the aquatic environments within the project area, and identifies specific streams and/or areas which support or potentially support aquatic resources (i.e., fish or invertebrate species). Table

3-31 identifies stream crossings with streamside vegetation, standing water, or other evidence of potentially important aquatic resources.

Overall, the stream resources along the project route are not well documented. Most of these streams are not managed by the CDFG (Regions 2, 3, and 4) for recreational or special-status species and have not been recently surveyed. The majority of the creeks traversed by the preferred alignment are intermittent in nature, flowing as a direct result of precipitation and local runoff. Consequently, the creeks do not support significant fish populations. Aquatic invertebrate populations are minimal, limited to areas of pooled water. Riparian vegetation along these predominantly dry washes is uncommon. In addition, the predominance of agricultural lands and grazing have removed most riparian vegetation, thus further altering the nature of the streams. Eight perennial streams will be crossed by the proposed project. Only one, Pacheco Creek, has flows sufficient to sustain fish populations. The primary importance of the streams in the project area is their value to terrestrial wildlife rather than to aquatic life.

In the southern portion of the project area, along the western edge of the San Joaquin Valley south of Merced County, aquatic resources are limited by low annual rainfall and negative net precipitation. Most of the creeks are small and flow only intermittently. Only during high rainfall years does water reach the valley floor; in most years creeks are dry within a few miles of their mountain sources (California Nature Conservancy 1984). The larger creeks (e.g., Panoche and LIttle Panoche) are also predominantly intermittent, drying up during summer or fall, and therefore unable to sustain fisheries or other aquatic life. Areas of pooled water are evident in Little Panoche Creek but not at the crossing. Two creeks mapped as perennial (Los Gatos and an unnamed creek) also do not support evident aquatic organisms.

In the northern portion of the project area, north of the Fresno/Merced County line, there is a greater number of flowing creeks or creeks with water pooled in some areas, although the majority of creeks crossed by the pipeline route are intermittent, with characteristics similar to those in the south. In addition, the project crosses a number of water distribution facilities (canals and aqueducts).

Three perennial creeks are crossed by the alignment in the northern area: one unnamed creek, Marsh Creek, and Pacheco Creek. Water was present in all three creeks at the time of the survey (July-August). At the unnamed creek crossing, which is characterized by the presence of cottonwood, sedges, cattails, and willow, Pacific tree frogs are common. Marsh Creek supports aquatic insects (Gerridae) as well as many terrestrial organisms. The flow in Pacheco Creek is subject to tidal influence from Suisun Bay. While no aquatic species were observed during the field survey, other studies indicate the following species are likely to occur in Pacheco Creek (Brown and Caldwell 1985): the native fish species Sacramento sucker, Sacramento western roach, and threespine stickleback; and the exotic species carp, golden shiner, mosquito fish, green sun fish, bluegill, and Redear sunfish.

The pipeline route crosses seven intermittent creeks in the northern portion of the project area. In general, they vary from being unvegetated dry washes to having water pooled in areas and supporting some riparian vegetation and aquatic life. These creeks include Ortigalita Creek crossing #3, Salt Creek, Quinto Creek, Garzas Creek, Orestimba Creek, Crow Creek, and Del Puerto Canyon. Of the seven, only Salt Creek does not support some riparian vegetation. Salt Creek is in a heavily overgrazed area, denuded of vegetation by cattle and human disturbance. Backswimmers (Gerridae) are characteristic of the limited aquatic organisms present.

The other six creeks with water present in the dry season support some riparian vegetation and aquatic organisms. Mosquito fish, tadpoles, crayfish, and backswimmers are common organisms present. No large fish appear to inhabit the pooled areas. The riparian vegetation found in these areas ranges from cattails and sedges to willows, cottonwood, and sycamore with herbaceous understory vegetation. A more detailed account of the Orestimba creek crossing is presented above under Riparian Habitats. The crossings of Ortigalita Creek (#1 and #2), Kellogg Creek, and an unnamed creek at MP 222.8 are typically dry in the summer. Some vegetation is present (cattails and sedges) but no aquatic organisms are evident.

In addition, the project route crosses several water transmission facilities (see Table 3-13 in Section 3.2.4). These constitute a perennial source of water for the area, but provide very limited aquatic habitat. The California Aqueduct of the State Water Project and the Delta Mendota Canal of the federal Central Valley Project (Bureau of Reclamation) both support game and non-game fish species. These species originate primarily in the Sacramento Delta (or in water facilities such as reservoirs). They become entrained in water intake facilities and are then transported into the aqueduct and canal system. Neither the aqueduct nor the canal is stocked with fish for recreation nor managed by the CDFG for any special status species or native fish species (D. Peterson, DWR, personal communication). These facilities do not provide spawning or rearing habitat nor do they support important populations of native fish species.

Fish species commonly found in these water facilities include game fish, e.g., channel catfish, striped bass, white catfish, black bullhead, and starry flounder, as well as non-game fish, e.g., threadfin shad, threespine stickleback, California roach, and carp. The Bureau of Reclamation and the California DWR provide public access to these facilities for recreational fishing.

3.3 ALTERNATIVE ROUTES

The only feasible alternative routes to the proposed route involve relatively minor deviations. The reason for this is the physiographic nature of the San Joaquin Valley, which stretches for 260 miles from the Tehachapi Mountains to the Sacramento River Delta, with an average width of 50 miles. The San Joaquin valley is confined by the Sierra Nevada (to 14,492 feet ASL) and the Coastal Ranges (up to 5,840 feet ASL). Due to these constraints, the presence of highly productive agricultural lands to the east, and the locations of the

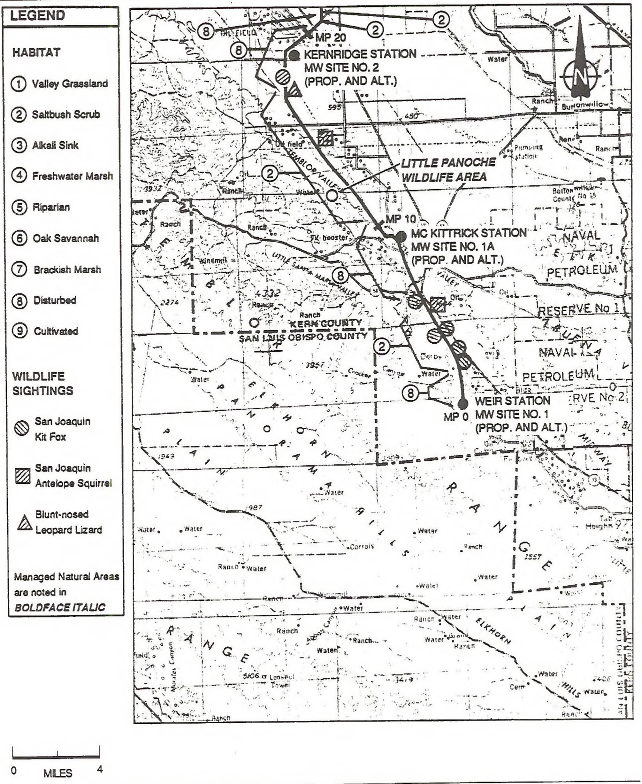


FIGURE 3.5
HABITAT BY MILEPOST,
WILDLIFE SIGHTINGS, MANAGED NATURAL AREAS
MILEPOST 0-21.2

SOURCE: ESA and Ecology & Environment

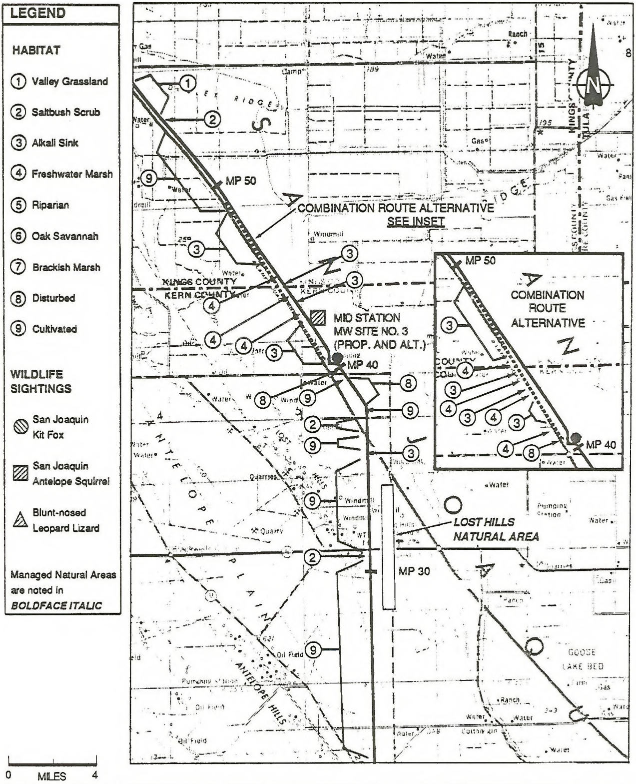


FIGURE 3.6
HABITAT BY MILEPOST,
WILDLIFE SIGHTINGS, MANAGED NATURAL AREAS
MILEPOST 21.2-56.8

SOURCE: ESA and Ecology & Environment

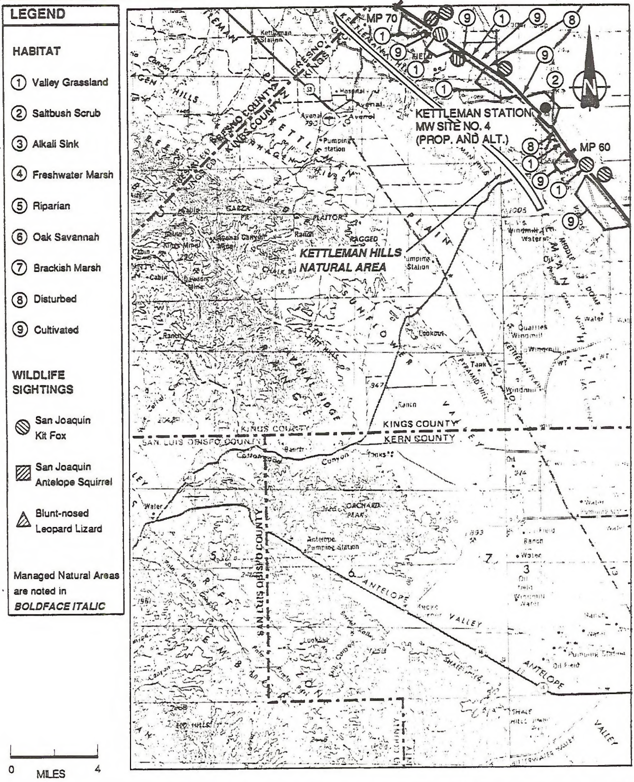
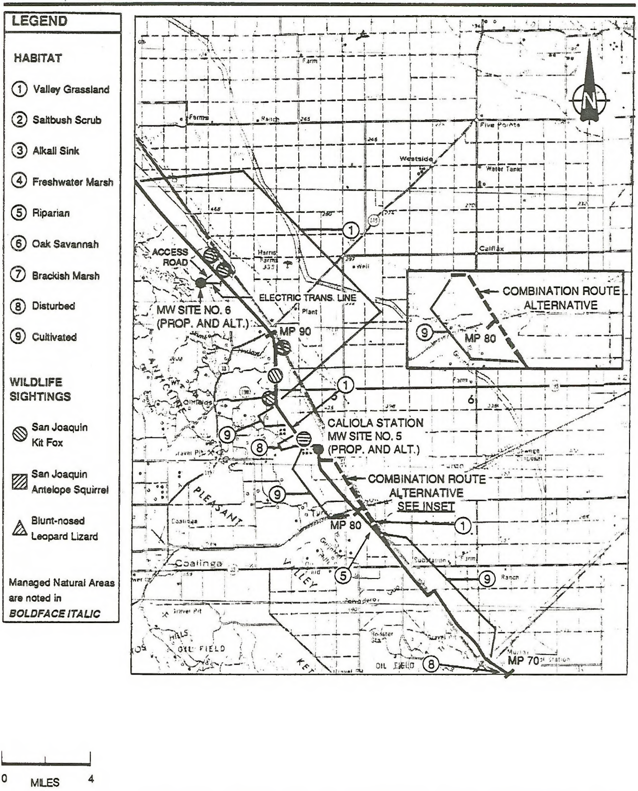


FIGURE 3.7
HABITAT BY MILEPOST,
WILDLIFE SIGHTINGS, MANAGED NATURAL AREAS
MILEPOST 56.8-70.7

SOURCE: ESA and Ecology & Environment



SOURCE: ESA and Ecology & Environment

FIGURE 3.8
HABITAT BY MILEPOST,
WILDLIFE SIGHTINGS, MANAGED NATURAL AREAS
MILEPOST 70.7-97.3

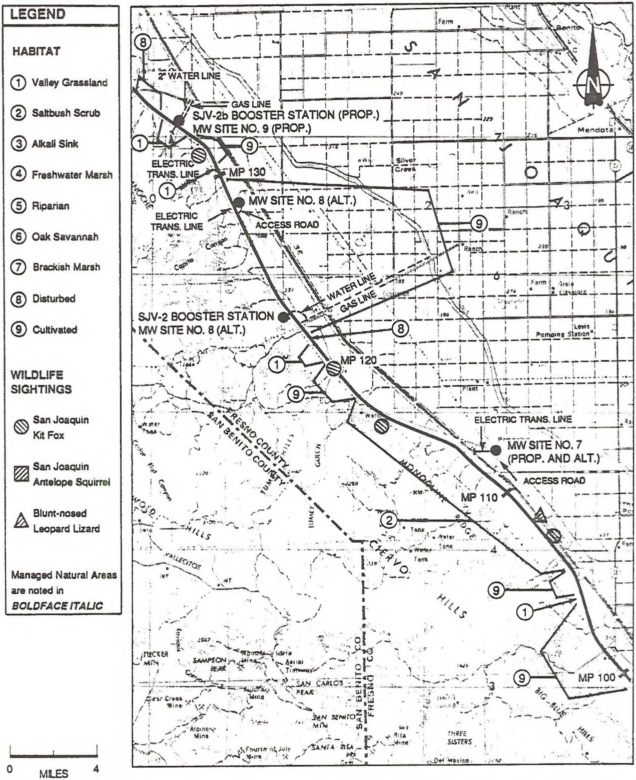


FIGURE 3.9
HABITAT BY MILEPOST,
WILDLIFE SIGHTINGS, MANAGED NATURAL AREAS
MILEPOST 97.3-135.6

SOURCE: ESA and Ecology & Environment

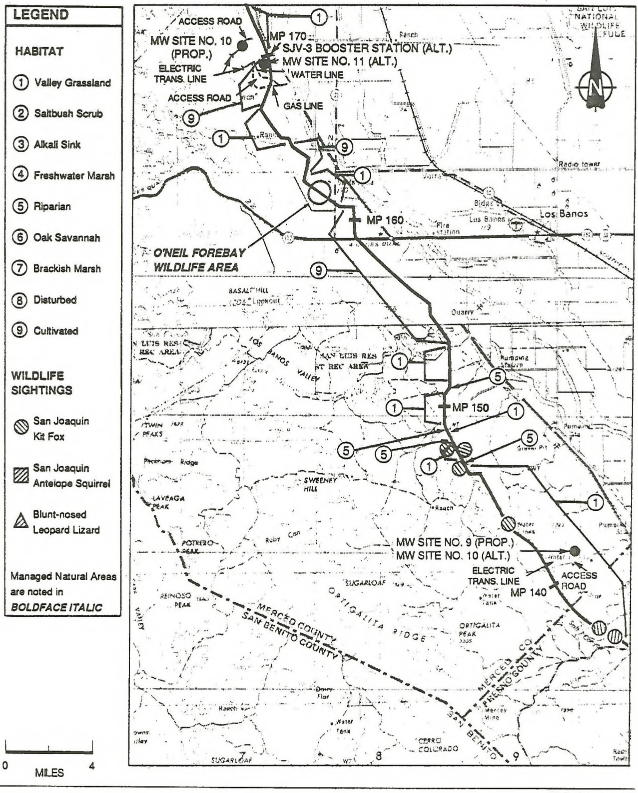


FIGURE 3.10
HABITAT BY MILEPOST,
WILDLIFE SIGHTINGS, MANAGED NATURAL AREAS
MILEPOST 135.6-174.6

SOURCE: ESA and Ecology & Environment

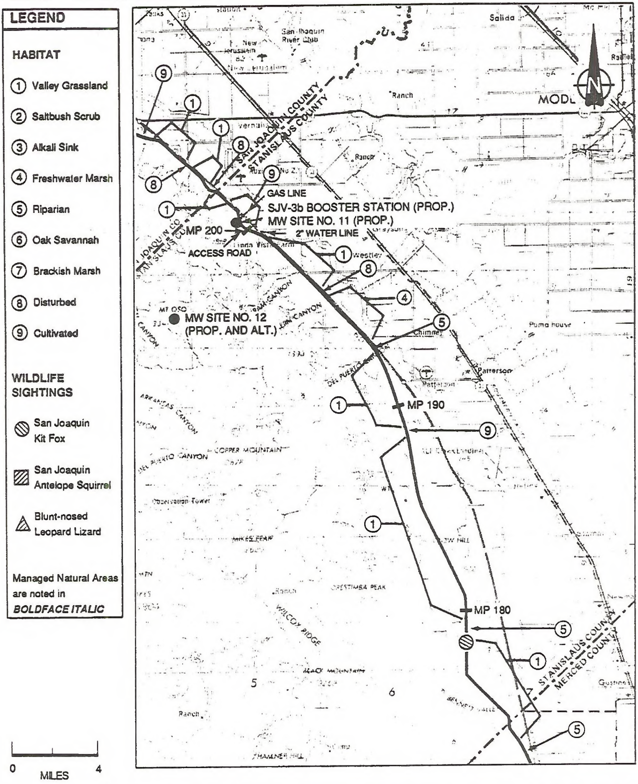


FIGURE 3.11
HABITAT BY MILEPOST,
WILDLIFE SIGHTINGS, MANAGED NATURAL AREAS
MILEPOST 174.6-207.8

SOURCE: ESA and Ecology & Environment

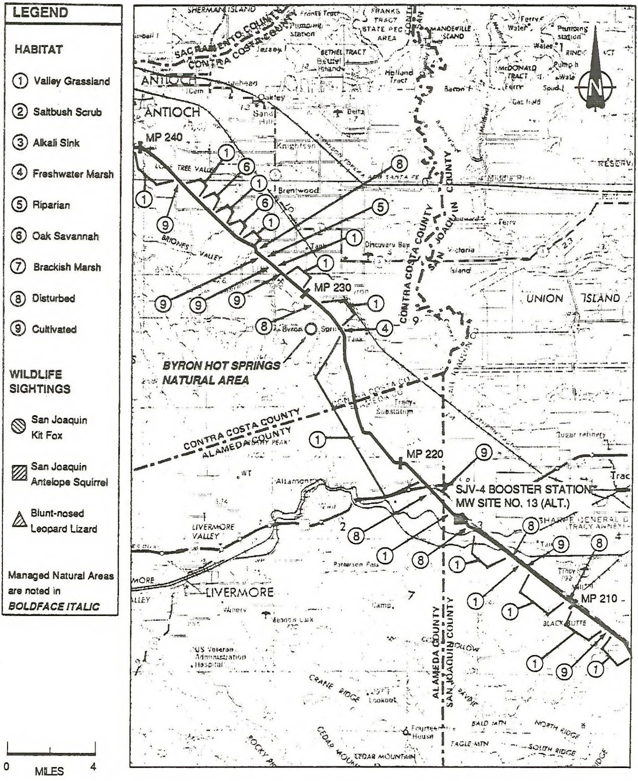


FIGURE 3.12
HABITAT BY MILEPOST,
WILDLIFE SIGHTINGS, MANAGED NATURAL AREAS
MILEPOST 207.8-241.1

SOURCE: ESA and Ecology & Environment

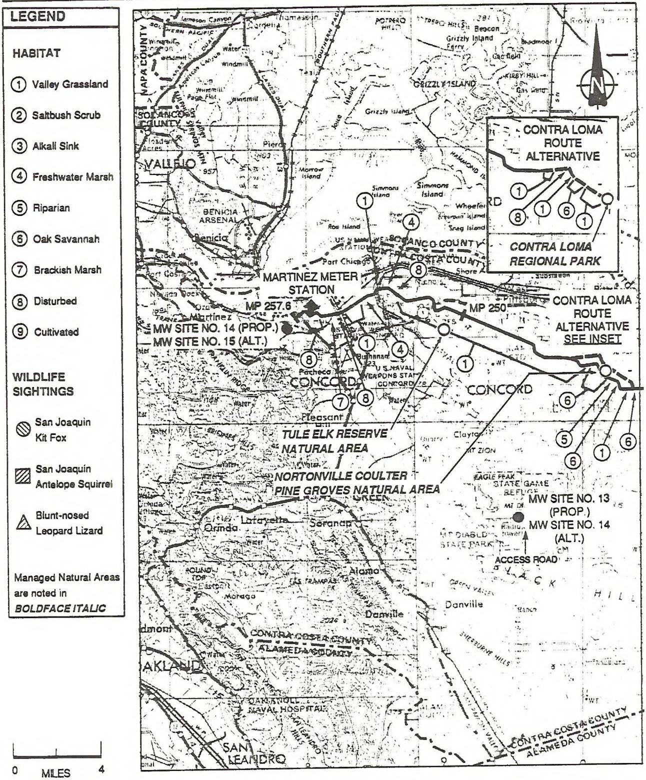


FIGURE 3.13
HABITAT BY MILEPOST,
WILDLIFE SIGHTINGS, MANAGED NATURAL AREAS
MILEPOST 241.1-257.6

SOURCE: ESA and Ecology & Environment

northern and southern termini, the proposed route has been aligned as a relatively direct route running along the base of the easternmost scarp of the Coastal Ranges. I-5 and other transmission/transportation lines are located in this same corridor for similar reasons, and major alternatives would be impractical.

The overall description of the existing environment presented in Section 3.2 pertains to the two alternative routes--the Combination Route and the Contra Loma Route. These alternatives traverse the same region and the same counties as the proposed route. The geology and geological hazards are similar; surface and groundwater water resources are the same; meteorology and air quality are the same; and the socioeconomic environment is also the same as for the proposed route.

The Combination Route and the Contra Loma Route differ from the proposed route in certain details. Route-specific details are dependent on the final alignment and will require consideration at the time of the centerline survey and right-of-way acquisition. Examples of such details are the location of residences, road and stream crossing routes, the location of trees and groups of trees, individual steep slopes, and rock outcrops. Such features can occur along both the proposed route and the alternatives and their exact location with respect to the identified routes are generally beyond the scope of this report.

Overall, since the selected alternatives are near the proposed route and the environment along the alternatives will differ only in certain, route-specific details, the environmental description in Section 3.2 applies. This section describes only those features that clearly differ from the proposed route.

3.3.1 Combination Route

The environment traversed by the Combination Route is similar to that described for the proposed route in regard to the following environmental features:

- Geology and Topography (see Section 3.2.1, also Appendix C).
- Geological Hazards (see Section 3.2.2).
- Soils (see Section 3.2.3, Tables 3-4 and 3-5).
- Surface Water (see Section 3.2.4, Table 3-13).
- Groundwater (see Section 3.2.5).
- Air Quality (see Section 3.2.6).
- Socioeconomics (see Section 3.2.7).
- Noise (see Section 3.2.8).
- Land Use and Recreation (see Section 3.2.9).
- Paleontological Resources (see Section 3.2.11).
- Cultural Resources (see Section 3.2.12).
- Biological Resources (see Section 3.2.13).

The environmental features that differ (visual resources) are described below.

Visual Resources

The Combination Route is located within VRM Class 1, where the route closely approaches and trends parallel to I-5, a designated scenic highway in Fresno County. I-5 in this area is not a designated state scenic route. Where the right-of-way is located farther from I-5, it is considered to be part of the scenery visible from I-5, and thus in a Class 2 area.

3.3.2 Contra Loma Route

The Contra Loma Route traverses a similar area in the same county (Contra Costa) as the proposed route. It is similar to the proposed route in regard to all aspects of:

- Groundwater (see Section 3.2.5).
- Air Quality (see Section 3.2.6).
- Socioeconomics (see Section 3.2.7).
- Paleontological Resources (see Section 3.2.11)
- Cultural Resources (see Section 3.2.12).

The environment traversed by the Contra Loma Route differs from the proposed route in regard to geology and topography, geological hazards, soils, surface water, noise, land use, visual resources, and biological resources. Each of these is described below.

Geology and Topography

The geology of the area traversed by the Contra Loma Route is similar to the geology described for the proposed route; however, the Contra Loma Route traverses an area of less rugged topography and lower elevations than the proposed route, therefore avoiding slopes of from 30% to as steep as 75%. This alternative route is aligned over more alluvial fan deposits than the corresponding portion of the proposed route.

Geological Hazards

The Contra Loma Route is affected by similar geologic hazards as the proposed route. The potential for liquefaction is higher than along the proposed route because the Contra Loma Route traverses debris flow channels from slope erosion that prevails upslope of this area. Such debris is particularly susceptible to liquefaction.

Soils

The Contra Loma Route, which extends for approximately 4 miles in Contra Costa County, was identified for the primary advantage of avoiding areas susceptible to slumping or landslides. The predominant soils encountered are the gently sloping and very deep Capay-Rincon soils, which are free of major limitations and pose only a slight erosion hazard. This alternative route also traverses Altamont, Diablo, and Fontana soils units, which have severe limitations and high potential for slumping for a distance of approximately 1 mile as compared to approximately 3 miles for the corresponding portion of the proposed route.

Surface Water

The Contra Loma Route is located near the proposed route and, as such, will traverse the same surface waters, with flow and quality characteristics similar to those described for the proposed route. However, the Contra Loma Route would pass within 0.1 mile of the Contra Loma Reservoir, which is a sensitive area, whereas the corresponding portion of the proposed route would come no closer than 0.5 mile to the reservoir.

Noise

The Contra Loma Route passes through two noise-sensitive areas not crossed by the proposed route--Contra Loma Regional Park, and a subdivision within the city limits of Pittsburg. As mentioned in Section 3.2.8, policies in the Contra Costa County noise element call for a 45 dB(A) (CNEL) limit in these areas, while construction noise will locally have a sound level of 60 dB(A).

Land Use and Recreation

The land uses along the Contra Loma Route differ from those along the proposed route in Contra Costa County. The Contra Loma Route does not traverse the Black Diamond Mines Regional Preserve, but does cross the Contra Loma Regional Park, a proposed residential development (Sky Ranch), and an existing residential area. The corresponding portion of the proposed route does not cross any residential areas.

Visual Resources

The Contra Loma Route crosses areas of VRM Class 1, including Somersville Road, a Contra Costa County-designated scenic rural recreation route, and Paseo Corte Road, a county-designated scenic minor throughfare/collector route. As stated in regard to noise and land use, this alternate route also crosses Contra Loma Regional Park.

Biological Resources

The Contra Loma Alternative crosses valley grassland and oak savannah, as does the corresponding portion of the proposed route, but it also crosses areas of disturbed habitat caused by the expansion of residential areas. No special-status plant or animal species were observed during the biological surveys along this alternative route. This route also crosses two ephemeral streams of low biological value.

3.4 THREE NEW BOOSTER STATION ALTERNATIVE

This alternative proposes to utilize three new booster stations (SJV-2, SJV-3, and SJV-4) along the proposed route. These stations would be located in Fresno, Merced, and San Joaquin counties, respectively. The environment is generally similar to that described for the proposed project in Section 3.2. Only certain site-specific details are highlighted in this section.

Geology and Topography

The alternative booster station SJV-2 site is just north of the Panoche Creek crossing, parallel to Route 5, in Fresno County. The booster station is situated along the eastern flank of the Panoche foothills, in gently sloping terrain of alluvial and flood basin deposits. Bedrock underlying the area consists mainly of Tertiary age shales, sandstones, and mudstones.

The proposed booster station SJV-3 and associated power and water sources are located in the northwestern portion of Merced County, at the Quinto Creek pipeline crossing. This region is characterized by gently sloping alluvial deposits, approximately 8 feet thick. These deposits are underlain by Upper Cretaceous sandstones of the Great Valley Sequence.

The proposed booster station SJV-4 is located in the western margin of San Joaquin County, south of the intersection of U.S. Highways 205 and 580. The booster facilities are situated in an area of gently sloping terrain along the eastern flank of the foothills. The area is underlain by a thin veneer of alluvial sediments which are underlain by Tertairy age soft sandstone, with intervals of tuff and shale.

Geologic Hazards

Geologic hazards at each of the proposed additional booster stations will be similar to those found along the proposed project (see Section 3.2.2). There exists the potential for intense ground shaking throughout the region. Liquefaction associated with seismic events could affect unconsolidated soils associated with these three alternative booster station sites.

Soils

The three alternative booster station sites and associated microwave tower sites will have soil characteristics and hazards similar to those defined in Section 3.2.3. The soil associations are referenced in Table 3-38, which follows, and can be cross-referenced with Tables 3-5, 3-6, and 3-8 in Section 3.2.3, which identify the soil characteristics for Fresno, Merced, and San Joaquin Counties, respectively.

Surface Water

Surface water conditions at each of the alternative booster stations (SJV-2, 3, and 4) are similar to the surface water conditions found along the proposed route, as described in Section 3.2.4. The sites lack surface water resources; booster station SJV-2 would be within 0.5 miles of the nearest stream, SJV-3 would be about a mile from the nearest stream, and SJV-4 would be several hundred feet from its nearest stream. In all three cases, these streams are intermittent.

Groundwater

The groundwater basins and hydrologic conditions underlying the additional proposed booster stations are similar in characteristics to

Table 3-38

SOIL ASSOCIATIONS FOR ALTERNATIVE BOOSTER STATION AND MICROWAVE TOWER SITES, BY COUNTY

County	Facility	Soil Associations*
Fresno	SJV-2 and Microwave No. 9	Unnamed alluvial fan
	Microwave No. 8	Unnamed terrace soil
Merced	SJV-3 and Microwave No. 12	O'Neill-Apollo
San Joaquin	SJV-4 and Microwave No. 14	Chaque-Carbona

*Tables 3-4 through 3-11 in Section 3.2.3 describe the soils characteristics.

the hydraulic conditions of the proposed route, as described in Section 3.2.5.

The groundwater quality is generally poor in the shallow aquifers of the area. Potable groundwater is usually found at depths of 20 feet to several hundred feet. The proposed 2-inch water line to supply booster station SJV-4 will be connected to an existing water well located nearby. Well water is available at SJV-2 and SJV-3.

Air Quality

The existing air quality environment and meteorological conditions are the same as those described for the proposed system (see Section 3.2.6).

Socioeconomics

The three alternative booster station sites are in San Joaquin, Merced, and Fresno counties. The socioeconomic conditions described for these counties in Section 3.2.7 also apply to this alternative. All three sites are near the established transportation network (I-5)--SJV-2 is within 2 miles, SJV-3 is within one-half mile, and SJV-4 is adjacent to the interstate highway.

Noise

Booster station SJV-2 would be located in Fresno County east of I-5 near Panoche Creek. The maximum background level for this non-sensitive, predominantly rural-agricultural area, with an average of 20 to 60 people per square mile, is approximately 35 to 40 dB(A).

Booster station SJV-3 in Merced County would be located on the west side of I-5, 5 miles north of the San Luis Reservoir and O'Neill Forebay. Exterior sound levels in this predominantly rural and undeveloped setting (with an average of 20 people per mile) have a maximum background range of around 40 dB(A). This is not an area of sensitive receptors.

Booster station SJV-4 would be located southeast of Interstate 580 and U.S. Route 50 in a predominantly rural setting that is not a sensitive noise area.

Land Use and Recreation

Booster station SJV-2 would be located in Fresno County, east of I-5 near Panoche Creek. The site is located in an area designated for agriculture.

Booster station SJV-3 and microwave tower No. 12 in Merced County would be located on the west side of I-5, 5 miles north of the San Luis Reservoir and O'Neill Forebay. The site is located in an area used for foothill pastures according to the Merced County Land Use Element Map.

Booster station SJV-4 and microwave tower No. 14 would be located in San Joaquin County in an area where land use is primarily agricultural. There is a solid waste disposal facility, Corral Hollow landfill, about 4 miles southeast of the proposed station.

None of the sites is on public land or in a specially protected land use area.

Visual Resources

The visual resources for the three booster station sites and associated microwave towers are generally similar to those described for the proposed system. These resources are identified in Table 3-39.

Paleontology

Paleontological resources at the sites of alternative booster stations SJV-2 and SJV-3 are of low to moderate sensitivity. However, alternative booster station SJV-4 would be located on a site with a high potential for encountering significant paleontological resources.

Cultural Resources

Cultural resources would not be any different from the proposed action for the three new booster station alternative.

Terrestrial and Aquatic Biology

Biological resources for the three new booster station alternative are the same as those described for the proposed action in Section 3.2.13.

3.5 ALTERNATIVE POWER SOURCE CONFIGURATIONS

One of the alternative power source configurations involves the use of electricity and crude oil to power the pumps and heat the oil at the new booster stations (SJV-2b and SJV-3b), while the other alternative configuration would use electric power and natural gas (see Section 2.2.3). The environmental conditions described in Section 3.2 for the proposed project apply equally to this alternative, which would be implemented in the same geographic location, at the new booster station sites.

3.6 OVERHEAD AQUEDUCT CROSSINGS

The proposed action includes eight aqueduct and canal crossings of which two are by overhead suspension bridges and six are underground. Under this particular alternative, all six remaining major aqueduct and canal crossings will also be by suspension bridge. Two minor diversion/transport channels in Contra Costa County--the Contra Costa Canal and Mokelumne Aqueduct--will be traversed by conventional underground techniques, as in the proposed action. The overhead crossings planned under this alternative will occur at the same canal locations as the corresponding underground crossings of the proposed

Table 3-39

VISUAL RESOURCE CLASSIFICATION
FOR ALTERNATIVE BOOSTER STATION SITES

Facility	VRM Class	Description	View From
SJV-2 and Microwave No. 8	2	Flat agricultural fields, transportation lines	BG: I-5*
Microwave No. 9	2	Flat agricultural fields, transportation lines	MG: I-5
SJV-3 and Microwave No. 11	1	Grassy hills	MG: I-5
SJV-4 and Microwave No. 13	1	Grassy hills, booster ststion	BG: I-5

*MG = View in middle ground
BG = View in background from I-5

action. For this reason, the affected environmental setting of this alternative is identical to that described for the proposed action in Section 3.2 and more particularly in reference to surface water resources in Section 3.2.4.

4. ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This section discusses environmental impacts that could result from the construction, normal operation, accidental conditions, and abandonment of the proposed project and its alternatives. As required by both the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), the criteria used to determine whether impacts are significant are outlined for each issue or environmental feature of concern. Only impacts that are deemed significant must be covered in detail under NEPA and CEQA. Therefore, anticipated impacts whose magnitudes were below the significance thresholds were not assessed in detail in the impact analyses conducted for this EIR/EIS. This approach has been followed throughout, except when potentially significant impacts were identified during the scoping process or by responsible agencies prior to EIR/EIS analysis; these impacts are described in detail regardless of whether or not they exceed the significance criteria.

4.2 PROPOSED ROUTE

4.2.1 Geology and Topography

Impacts to geology and topography were assessed based on a review of maps and baseline data, including published reports of the U.S. Geological Survey (USGS) and the California Division of Mines and Geology; USGS quadrangles; aerial overflights of the proposed route; and consultations with state and federal agencies. This information, presented in Section 3, provides the basis for the following discussion on geologic impacts.

For geology and topography, impacts were determined to be significant if project construction or operation would disturb or restrict:

- Unique geologic features or resources;
- Access to commercially important geologic materials such as sand and gravel deposits, minerals, or petroleum resources; or

- Important paleontological resources.

Construction

The construction of the proposed project will not affect any unique geologic resources, since there are none along the proposed route. Geologic resources along the route that could be affected by construction are limited, as far as is known, to those areas of potential sand and gravel exploitation identified in Section 3.2.1. The areas of sand and gravel that will be temporarily removed from potential exploration cannot be considered "commercially important." Alternative sources exist, and the pipeline will not prevent exploration of the greater part of those deposits that it does cross, if they do become commercially viable. Gravel, by its nature, is a low-value bulk commodity. These impacts are therefore not considered significant. Excavation of such areas within the pipeline right-of-way could threaten the structural support of the pipeline, thus threatening its integrity. Therefore, these small areas of sand and gravel will be restricted from potential exploitation during the lifetime of the project; this is an insignificant impact.

There will be no effect on existing oil or gas exploitation as a result of project construction, but the availability of the pipeline may make newly discovered marginal oil fields commercially productive.

It is possible that important paleontological resources may be discovered during project construction (see Section 4.2.11).

The pipeline route is aligned across a multitude of drainages and toe slopes. Some increase in erosion may occur along segments of the pipeline both during and after construction, particularly in areas of steep slope and bedrock. Slope stabilization, right-of-way restoration and revegetation, and mitigation measures for instream construction are incorporated in the proposed action in order to minimize erosion (see Sections 4.2.3 and 4.2.4).

Along most of the route, no cuts or fills are expected except to construct and fill the pipeline trench. Alterations of topography will be minimal during construction, and the route will be restored to its former condition as much as possible. Steep topography would be impacted in Contra Costa County and in the Alameda County where grading of the construction right-of-way would involve cutting into hillsides and reducing the grade on unstable slopes. Such impacts will not be significant.

Materials that cannot be excavated with either a trenching machine or a backhoe are not generally encountered in alluvial deposits. Most of the geologic units along the route contain occasional cemented beds that could be difficult or impossible to excavate with conventional trenching equipment. Only a fraction of the areas indicated in Table 3-2 will require blasting, depending on the degree of cementation (induration) of the rock. It is anticipated that the majority of these bedrock sections can be pre-ripped by bulldozer but may require supplementary blasting in restricted areas. None of the locations listed in Table 3-2 is less than one-half mile from an existing building, even in Contra Costa County. In general, these beds do not appear to be extensive and they are relatively thin (i.e., only a few feet thick).

The construction of ancillary facilities will not significantly impact geologic resources. The area of surficial geologic disturbance is small for all of the project facilities.

Operation

Operation of the pipeline and its ancillary facilities will not impact the geology and topography of the affected environment. Maintenance of the right-of-way during operation will prevent degradation of the physiographic environment.

Accidents

An oil spill or a fire/explosion will not significantly impact geology or topography because there are no unique geologic features or commercially important resources within the project area. Impacts to paleontologic features are discussed in Section 4.2.11.

Abandonment

Abandonment in-place would result in no significant geologic impacts.

4.2.2 Geological Hazards

Potential impacts to pipeline and ancillary facilities resulting from direct and indirect seismic effects (vibration, ground motion, liquefaction), surface faulting, slope instability (slumping and landsliding), ground subsidence, and soils with excessive shrink-swell potential were analyzed based on the information presented in Section 3. Impacts were considered significant if the following conditions existed:

- The potential for rupture or substantial damage to the pipeline or ancillary facilities; or

- The need for special engineering design or maintenance procedures to prevent damage to or failure of the pipeline.

Significant geologic hazards are discussed in detail below, and are summarized in Table 4-1.

Construction

In general, geologic hazards will have no significant impact on construction. Minor slides may be caused on unstable slopes if the pipeline trench is not shored. Such impacts will be minor and will be corrected during construction so that the pipe can be laid and construction may continue. The standard procedures for trenching along

Table 4-1

SUMMARY OF GEOLOGIC HAZARDS ALONG THE PROPOSED ROUTE

Hazard	Location	Soil Type	Potential	Consequences
GROUND RUPTURE AT FAULT CROSSINGS	O'Neill (MP 148, 152, 161)	Alluvial sediments	Inactive	No significant impacts
	San Joaquin (MP 173.2)	Unfaulted, pre-Holocene alluvial sediment	Earthquake magnitude of 5 to 7	No significant movement, therefore no significant impacts.
	Antioch-Davis (MP 236.6)		Maximum credible earthquake of 6.6	Potential surface fault rupture; however damage to pipeline unlikely due to shallow burial and unconsolidated soils
	Concord (MP 256.7)	Delta sediments	Maximum earthquake of 6.75 to 7.25	Surface rupture causing pipeline to break; special design measures required

Source: Ecology & Environment, 1986

Table 4-1 (cont.)

SUMMARY OF GEOLOGIC HAZARDS ALONG THE PROPOSED ROUTE

Hazard	Location	Soil Type	Potential	Consequences
SUBSIDENCE	Northern Kings County southern Fresno County	Various	Addition of water during an exceptional rainfall	Impact not significant because no structural damage would result.
LIQUEFACTION	Vicinity of Concord fault	Delta sediments	Earthquakes featuring prolonged ground shaking	Impact not significant due to shallow burial of pipeline and flat terrain in areas of potential liquefaction
	Creek crossings	Saturated alluvium		Same as above; concrete casings will counter any temporary bouyancy
	Mid Station (booster station)	Alluvium	Seasonal perched water tables combined with intense ground shaking	Liquefaction causing failure of storage tank; special design measures required.

Source: Ecology & Environment, 1986

existing ranch roads will entail cutting into hillsides in places. In some cases, this may destabilize marginally stable slopes, but again, shallow failure of a cut slope would not be expected to affect the integrity of the pipeline. Regrading to restore the original topography will restabilize slopes when vegetation is restored (see Section 4.2.3).

Operation

The measures included in the project to address geologic hazards are discussed below.

Special design features that reduce or eliminate potential pipeline damage resulting from fault movement, landslides, and other geological hazards are being incorporated into the pipeline design. The designs will conform to the applicable stress criteria of the American National Standards Institute (ANSI) B31.4. Design criteria will include internal design pressure, surge pressure, test pressure, vacuum, fluid inertia loads, temperature, external pressure (including overburden), and differential movement due to surface fault displacement, local liquefaction, or other loss of support.

The pipeline crosses or passes close to four faults which were identified in Section 3 as sites of potential faulting and surface rupture: the O'Neill Fault west of Los Banos in Merced County; the San Joaquin Fault Zone west of Patterson in Stanislaus County; the Antioch-Davis Fault south of Antioch in Contra Costa County; and the Concord Fault east of Martinez, also in Contra Costa County. A fault is considered active based on historic data and evidence of movement that have displaced Holocene (recent) alluvium.

As discussed in Section 3.2.2, the O'Neill Fault System is inactive and the San Joaquin Fault Zone has not shown significant movement. Therefore, no significant impacts will result from the proximity of the pipeline to these faults. The Antioch-Davis Fault Zone and the Concord Fault, however, are considered to be seismically active.

The Antioch-Davis Fault has a very long recurrence interval and has the potential for surface fault rupture. The unconsolidated nature of the surrounding soils and the shallow depth of the pipeline, however, would most likely prevent any serious structural damage to the pipeline and thus avoid a significant impact, as long as ground shaking does not exceed intensity VIII on the Modified Mercalli Scale.

The Concord Fault is considered seismically active and produces unequivocal evidence of right lateral creep. Recent studies indicate that the pipeline traverses only one trace, located beneath the channel of Pacheco Creek. Due to the ability of the pipeline to stretch, there would be less danger of rupture in areas of unconsolidated material, such as Pacheco Creek, than in rock in this area. A fracture in a bedrock area would cause the pipeline to shear, resulting in an oil spill into the creek and, in turn, into Suisun Bay. However, estimates of a maximum potential earthquake are Richter Scale 7 or an

Modified Mercalli Intensity (MMI) of VIII or IX. This represents a significant environmental risk requiring special engineering design measures.

Local ground liquefaction may be expected in areas were saturated, cohesionless soils are subjected to prolonged ground shaking. The greatest potential for liquefaction of water-saturated granular alluvial soils is in Contra Costa County in the vicinity of the Concord Fault. However, since the alluvial soils are on flat terrain and are unlikely to flow much, the risk of any serious structural damage resulting from ground movement would appear to be minor. Thus, the impact is not significant.

Local subsidence should be expected in some areas if large amounts of rainfall or irrigation water are allowed to infiltrate into soils in the vicinity of the pipeline. The highest potential for subsidence, as mentioned previously, is in northern Kings County and southern Fresno County, and stems from compaction of soils due to the addition of water as, for example, during an exceptional rainfall. Impacts would not be significant because subsidence would not result in structural damage to the pipeline. Potential impacts from slumping or dimensional instability are discussed in Section 4.2.3.

Ancillary structures, booster stations, the storage tank at Mid station, and microwave towers are not located where ground rupture is a hazard. These facilities would be subject to the same probabilities of ground shaking as the pipeline. Where these facilities are located on bedrock, the intensity of ground shaking is likely to be less than for those facilities built in areas of unconsolidated sediments. The proposed storage tank at Mid station is in an area which is potentially subject to intense ground shaking (up to MMI of VIII) and has a high water table which could lead to liquefaction, a significant impact which requires engineering design measures.

The SJV-2b booster station and microwave tower are in an area subject to subsidence, but only in the event of increased irrigation or an exceptional rainfall; no significant impacts are expected. The site is located above flood levels. No other facilities are subject to potential secondary geologic hazards.

Damage from shrink-swell potential is considered nonexistent. The possibility of pipeline rupture from ground collapse caused by oil/gas or groundwater withdrawal is very remote and is addressed in Section 4.2.6.

<u>Accidents</u>

Geologic hazards that could result in spills are discussed above. An oil spill, fire, or explosion would not affect geologic hazards.

<u>Abandonment</u>

After abandonment, the pipeline would represent no further risk to public safety or the environment in terms of geologic hazards.

4.2.3 Soils

The following discussion of potential impacts to soils is based on the soil types and characteristics described in Section 3.

Project impacts are addressed mainly in terms of soils, without describing in detail the secondary impacts which only partially depend on soil characteristics. For these impacts, the reader is referred to other relevant descriptions in this section of the report. For example, soil erosion effects on water quality are discussed in Section 4.2.4, under surface water; liquefaction associated with shrink-swell potential and hydrocompaction, which depend on the presence of water in the soils, are discussed in Section 4.2.2, under geological hazards.

Project impacts on soils are significant if either construction or operation would prevent rehabilitation or revegetation of disturbed areas for longer than one growing season.

Criteria used to identify sensitive soils areas along the proposed route were derived from determinations made by the U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS) and the University of California Agricultural Extension, and/or were based on the judgment of professional resource specialists.

The applicant has identified general reclamation and erosion control measures to mitigate potential impacts on soils. These include: topsoil segregation and replacement on agricultural lands; use of erosion control features to limit steepness and length of slope; and soil preparation, reseeding, fertilizing, mulching, and monitoring of disturbed areas.

Construction

In general, construction of the pipeline will cause impacts to soils resulting primarily from:

- Accelerated soil erosion and deposition;
- Decreased productivity due to compaction and horizon mixing; and
- Increased potential for soil slumping.

Any of these factors, in addition to natural causes such as soil limitations and steep slopes, will make revegetation difficult and enhance the potential for a significant impact due to revegetation failure.

Sensitive soils are identified on the maps found in Appendix C. Potentially significant impacts are summarized in Table 4-2.

The potential for accelerated soil erosion, which could occur as sheet wash, rills, and gullies, exists in all counties where pipeline

Table 4-2

SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS ON SOILS, BY COUNTY

County	Slumping	Revegetation Failure and Erosion	Soil Degradation	Ponding	Revegetation Failure Due to Soil Chemistry
Kern	No	Mileposts 5-12	Mileposts 21-36	Locally	Mileposts 36-44
Kings	No	Mileposts 62-71	Mileposts 49-59	No	Mileposts 44-49
Fresno	No	Mileposts 82-96; 108-112	Mileposts 71-83; 120-132	Locally on alluvial fans and terraces	No
Merced	No	Intermittent stream crossings; Mileposts 138-158	No	Locally on alluvial fans and terraces	High lime content: Milepost 160
Stanislaus	No	Mileposts 176-179; 187-195	No	No	No
San Joaquin	No	Mileposts 202-204; 209-211	No	Locally on alluvial fans	No
Alameda	Yes	Mileposts 217-224	No	No	No
Contra Costa	Yes	Mileposts 224-225; 239-254	Intermittent in creek valleys; Mileposts 236-240	Locally	Mileposts 226-228; Mileposts 254-298

construction disturbs the soils and vegetative cover on steep and moderately steep slopes. The impact is potentially significant when the soils are thin and revegetation efforts may be only partially successful, or where rapid runoff, wind erosion, and evaporation compound the problem by removing soil materials and creating unfavorable seedbed conditions. The pipeline will be warm, and high permeabililty and evaporation will reduce soil moisture in the trench area, especially on sloping sites. These conditions are unfavorable for plant growth.

Though the erodibility of soils may vary somewhat, in general, those areas along the proposed route where slopes are moderately steep to very steep (15% slopes and greater) will be especially susceptible to erosion problems. Also, slumping is a potential hazard on slopes greater than 15% where clay soils predominate. This impact potential exists in Alameda and Contra Costa counties, where the slopes are particularly steep (30% to over 50%) and significant slumping and erosion hazard occurs for several miles. Slumping soils and slope instability constitute a hazard to the construction work force, and after installation, to the pipeline, especially on cut-and-fill or benched sections of the right-of-way. The number of steep slopes is given in Table 4-3 to provide a quantitative estimate of the steeply sloping sections posing a high erosion and/or soil slumping hazard.

Soil degradation on productive agricultural lands, resulting from mixing of horizons, will be avoided by selective segregation and replacement of topsoil. However, the already difficult conditions along the uncultivated portions of the route, i.e., climate and lack of complete vegetative cover even under natural conditions, could be exacerbated by mixing of soil horizons during ditching. This would increase the potential for revegetation failure, a significant impact.

Agricultural production along the route is generally a feature of bottom lands in creek valleys. On the alluvial soils, compaction of soils by heavy equipment reduces the infiltration rate and water-holding capacity of the soil. Compaction of clay soils having poor permeability may also increase the tendency to ponding, which interferes with agricultural practices and lowers production. However, routine land preparation such as disc plowing and harrowing could render this impact insignificant.

Revegetation will be difficult on soils having a high salinity content or which are high in lime. General vegetation mixtures will not establish themselves on saline or alkaline soils, and revegetation requires the use of tolerant species to avoid significant impacts. If revegetation is unsuccessful, other significant impacts, such as erosion, will also occur and compound the impact of revegetation failure, which is a significant impact.

Construction of ancillary facilities, booster stations, and microwave towers will preempt soils from their present productive use by covering them with pavement and structures for the long-term (about 6.5 acres). The primary concern would be steep access roads promoting

Table 4-3

STEEP SLOPING SITES ALONG THE PROPOSED ROUTE, BY COUNTY

County	Mileposts	Number of Slopes* >12%	Number of Slopes* >18%
Kern	6.5 - 6.8	--	1
	11.4 - 12	1	--
Kings	64.5 - 71	34	--
Fresno	92 - 96.5	10	--
	108.8 - 111.5	8	--
	134 - 138.8	8	2
Merced	138.8 - 139	1	--
	140.5 - 146.2	5	1
	150.5 - 155.5	5	2
	156.5 - 157	1	--
Stanislaus	177.5 - 179.5	4	--
	185.5 - 194.5	18	--
Alameda	218 - 221	6	--
	223 - 224.3	4	--
Contra Costa	224.3 - 226	6	--
	230 - 235	4	--
	240 - 254	5	59

* Estimate based on USGS topographical maps (1:24,000).

erosion. However, the proposed microwave tower sites are already accessible, with the exception of microwave station No. 10, which requires 150 feet of access road on Cottonwood Hill. The applicant will perform additional soil and engineering studies to determine foundation requirements for the booster stations and the Mid station storage tank.

Operation

In Alameda and Contra Costa counties, the potential for soil to slump upon becoming wet and for significant erosion to occur if the right-of-way is not adequately stabilized and revegetated also constitute a hazard to the pipeline system during operations.

Accidents

Oil spill impacts would primarily involve pronounced effects on physical, chemical, and microbiological properties of soils and on the growth of vegetation.

Oil-contaminated soils exhibit decreased infiltration rates and a resistance to wetting from the surface; however, once "wetted," these soils tend to retain moisture. More severely contaminated soils may exhibit deflocculation and loss of structure, rendering the soils more susceptible to erosion (Ellis and Adams 1961).

Microbial activity is enhanced in soils after contamination by petroleum hydrocarbons. Aerobic, and on a lesser scale, anaerobic organisms utilize petroleum hydrocarbons in their metabolism. Reducing conditions accompany the decomposition and assimilation processes of microorganisms in these soils, greatly increasing exchangeable manganese and ferrous ions. The increase of exchangeable manganese is most often to toxic levels, inhibiting plant growth for a considerable period. If the soil is returned to its more normal oxidation state (by cultivation and aeration), vegetation growth will be restored.

Numerous studies have shown that when soils are severely contaminated with crude oil, vegetation is virtually eliminated for a period of time. However, once the source of contamination is removed, and if the soils are aerated, vegetation returns in a short period of time, and often yields more productive growth than adjacent unaffected soils (Ellis and Adams 1961).

In general, any oil spill occurring from the pipeline would be considered small in magnitude, due to the limited potential for crude oil to spread over large areas of land. This is generally a result of crude oil's high viscosity. However, the magnitude and duration of the impacts to soils would depend on conditions in the spill area, such as infiltration, depth of contamination, soil characteristics (depth, permeability, structure, etc.), topography, and vegetative cover. From McKay and Mohtadi's (1957) studies of 53 oil spills in Alberta, Canada, as well as their studies of experimental crude oil spills, an equation was derived for estimation of the area affected by a heated crude oil spill:

$$\text{Spill area } (m^2) = 53.5 \,[\text{spill volume } (m^3)]^{0.89}$$

or:

$$\text{Spill area } (ft^2) = 112 \,[\text{spill volume (bbls)}]^{0.89}$$

Using McKay and Mohtadi's equation, oil spills of 2,000 barrels, 7,500 barrels, and 15,000 barrels could be predicted to affect areas of approximately 2, 7, and 13 acres, respectively. An oil spill might affect fewer acres on level deep soils than would be estimated by the equation, and more acres when the affected area is characterized by steeply sloping shallow soil areas, void of sorbent vegetation.

Agricultural areas, and especially the cultivated croplands, would be most sensitive to soil spill impacts. Contamination of the soils, cleanup activities, and any subsequent land treatment efforts would involve crop production losses. However, due to ease of accessibility and workability of the soil, remediation of an oil spill on croplands and pastures can be generally accomplished over a shorter time period than in the shallow soil rangelands.

Abandonment

Abandoning the pipeline in place will not result in additional soil impacts.

4.2.4 Surface Water

This section discusses the potential impacts to surface water resulting from pipeline construction, operation, accidental spills, and abandonment. A county-by-county description of sensitive surface waters in the project area is given in Appendix C. The methodology used to determine project impacts to surface water consists of evaluating the effects of proposed construction/operation procedures on surface water features (e.g., stream flow, water quality) and the potential effects of stream characteristics on the proposed project (e.g., scour depth and 100-year flood zones).

Impacts to surface waters from project activities are significant if they have the potential to result in:

- Increased sediment loads and resuspension of sediments;
- Degradation of water quality below beneficial use criteria recognized by EPA, the California Department of Health Ser vices, or the California SWRCB;
- Reductions or limitations in the supply of surface water volume to current users and important aquatic habitats in accordance with low-flow criteria established by the SWRCB, CDFG, or the USFWS;
- Damage to, or reduction in size of, critical aquatic habitats, such as spawning areas;

- Streambed alteration as a result of the project, or exposure of the pipeline because of scouring; or

- Construction of any permanent above-ground facilities in 100-year flood zones.

Construction

The project includes several measures to reduce impacts to surface waters. For example, construction through streams will be conducted during the dry season. In addition, the area of disturbance in streams and rivers will be contained, any disturbed areas will be stabilized, and the time required for construction will be reduced. Required low flow volumes will be maintained. In flood-prone areas where the potential for scour exists, the pipeline will be constructed with concrete-coated pipe to prevent pipeline buoyancy; and hydrostatic test waters will be released in a controlled manner consistent with all regulatory requirements.

Potential areas sensitive to surface water-related impacts during construction are identified in Table 4-4. Good construction practices, including the measures identified above, are required to prevent construction impacts from exceeding the significance criteria. Construction during the dry season will prevent significant impacts to water quality. Soil erosion by surface runoff occurs naturally and sediment loads will not be substantially increased by construction of the project because the present loads are already very high during high runoff events. The annual sediment load entering the California Aqueduct in agricultural runoff is high, and sediment loads resulting from erosion during pipeline construction will be temporary and minor when compared to the annual loads. No significant effects on the water quality of the California Aqueduct will result even during a worst-case runoff event if one were to occur during pipeline construction (Lucas 1986).

The release of hydrostatic test waters will be controlled to prevent downstream sedimentation by erosion and scouring at the point of discharge.

Other potential construction impacts could result from spills of lubricating oils or equipment fuels to surface waters. Such impacts would be small in terms of areal extent but would be significant if, for example, the accident occurred in or adjacent to a stream that is actually flowing.

Impacts on aquatic habitats and organisms are discussed in Section 4.2.13.

Construction of the booster stations, microwave towers, and other ancillary facilities will have no significant impacts on surface water.

Table 4-4

AREAS SENSITIVE TO SURFACE WATER-RELATED IMPACTS DURING CONSTRUCTION, BY COUNTY*

County	Sedimentation of Irrigation Systems and Soils	Rugged Topography Compounding Sediment Loads	Construction in Perennial Streams
Kern	Yes	Lost Hills Area	--
Kings	Yes	Near Kettleman Hills	--
Fresno	Yes	Eastern boundary of the Ciervo Hills, Panoche and Little Panoche creeks	Los Gatos Creek
Merced	Locally	Ortigalita Creek and Salt Creek valleys, slopes north of Los Banos Reservoir	--
Stanislaus	Locally	Between Hospital and Lone Creek valleys	--
San Joaquin	Locally	Diablo Range	Lone Tree Creek
Alameda	Locally	Northeast Foothills of Alameda County	--
Contra Costa	Locally	Kellogg, Marsh, Deer, and Sand Creek valleys	Seal Walnut, and Pacheco creeks

* Sensitive areas where use of good construction practices as proposed will avoid significant impacts.

Operation

Areas sensitive to operation impacts are listed in Table 4-5. The pipeline could be affected by scour and natural channel geometry changes over its operational life. The proposed project crosses over 200 streams which are usually dry and intermittent. The stream valleys are crossed near where they enter the San Joaquin Valley, so that the proposed route is aligned across numerous slopes and toe slopes which form the western margin of the valley. As a result, the proposed alignment is vulnerable to erosion and pipeline exposure at numerous streams during periods of high-intensity runoff or large flow events. This hazard exists over the life of the project. Measures will be taken to ensure that at each of these vulnerable points the pipeline is buried below channel scour depth (see Section 6.2.3).

In flood zones, identified in Table 4-5, the hazard is that the buoyancy of the pipeline will cause the pipe to rise to the surface and become destabilized and exposed. This will be prevented by casing the pipe in concrete in flood zones.

The primary hazard to surface water quality over the life of the pipeline is from a major oil spill. This impact is addressed below under Accidents.

During pipeline operations, maintenance, including aerial surveillance of the right-of-way to identify and remedy instances of scour, will insure early detection of potential scour problems, thus minimizing impacts. No significant impacts will result from operation.

Accidents

The systems used to detect and minimize oil spills are discussed in Section 4.2.15, Oil Spill Potential and Effects. In general, the project will meet all required standards and an oil spill contingency plan has been developed for the project to quickly and properly clean up spills.

The maximum potential oil spill data presented in Section 4.2.15 indicate spill volumes can range from 592 barrels at Pacheco Creek to 23,000 barrels at the California Aqueduct crossing at milepost 32.3. Detection volumes of approximately 800 barrels should be added to the estimated drainage volumes, which are worst-case estimates for these specific locations. Under these worst-case conditions, small drainages and watercourses would be overwhelmed by these quantities of oil, and larger perennial streams and aqueducts would carry the oil many miles downstream. The most sensitive of the larger watercourses are the aqueducts which transport water to locations hundreds of miles away. Water from the California Aqueduct is treated prior to use for drinking water in the Central Valley. An oil spill reaching the aqueduct would adversely affect water treatment equipment, resulting in a significant adverse impact due to reduced drinking water supplies (Lucas 1986).

Table 4-5

AREAS SENSITIVE TO SURFACE-WATER-RELATED IMPACTS DURING OPERATIONS, BY COUNTY*

County	Water Sources at Risk from Spill	Flooding	Potential Catastrophic Flood/Release
Kern	California Aqueduct	Salt Creek, Chico Martinez Creek, Santos Creek	Zone A Flood Areas
Kings	--	Santos Creek	--
Fresno	Pleasant Valley Aqueduct	Los Gatos and Panoche creeks	Zone A Flood Areas
Merced	Delta Mendota Canal, California Aqueduct	--	Los Banos, O'Neill Forebay, and San Luis Reservoir
Stanislaus	--	Orestimba, Salado, and Del Puerto creeks	--
San Joaquin	--	Corral Hollow Creek	Zone A Flood Area
Alameda	Bethany Reservoir, California and Delta Mendota canals	--	--
Contra Costa	Contra Loma Reservoir, Marsh Creek Reservoir, Brackish Marsh, Mokelumne Aqueduct	Brushy and Pacheco creeks	Zone A Flood Areas

*Oil spills will result in significant impacts; potential damage to the pipeline system from catastrophic floods or releases is improbable. Flooding will be mitigated by weighting the pipe.

Water quality will be degraded by the more volatile fractions of the oil going into solution. Depending on the flow characteristics at the time of the spill, oil could be incorporated into the sediment of the stream bottom so that some oil would continue to be released after the surface spill was initially cleaned up. Duration of the water quality impacts would probably be only a few weeks after the oil was cleaned up, particularly for larger streams with a large enough flow to dilute any oil remaining after cleanup. This would depend on the time of the year and the volume of flow in the intermediate drainages.

As discussed in Section 3, the only sediment settling basin associated with the California Aqueduct that could be affected by the project is Arroyo Passajero (Lucas 1986). If an oil spill were to reach the basin, it might be contained on the surface long enough to be cleaned up. If not it could pass into the aqueduct and cause significant water quality degradation downstream. The likelihood of an oil spill occurring during a flood or sustained storm of sufficient magnitude to transport oil from the pipeline to the basin, a distance of 10 miles, is very small.

A catastrophic flood or release of water, such as could occur if the spillways on the O'Neill Forebay and San Luis Reservoir gave way, could uncover and wash out sections of pipeline, and thus cause an oil spill. This impact is significant but improbable, and can be mitigated by casing the pipe in concrete.

Abandonment

The pipeline will be purged of all oil and contaminants, flooded with water, and abandoned in place. The rust inhibitors in the water filling the abandoned line will degrade over time and will have no significant impacts. As the pipeline corrodes, it will begin to leak incrementally and in many places; no single, large release is expected. As such, there will be no effect in a stable channel. However, if the channel began to degrade, the pipeline might be uncovered, thus affecting the flow regime of the stream by catching sediment and trash. The pipeline and the right-of-way would require maintenance over the duration of the abandonment period to prevent scour and damage from exposure of the abandoned system.

4.2.5 Groundwater

Potential impacts on groundwater were assessed by combining information on aquifer characteristics developed in Section 3 with possible effects of pipeline operation on subsurface conditions. Sensitive aquifers or basins along the proposed route were defined in Section 3 as those which are shallow, unconfined, and overlain by highly permeable alluvium, or which are used for drinking water or irrigation. Significant impacts are those which would have the potential to:

- Measurably degrade water quality in any aquifer; or

- Restrict or limit the volume of groundwater available to existing users, for either irrigation, drinking water, or other beneficial uses, or measurably contribute to overdraft in any groundwater basin.

Construction, operation, abandonment, and oil spills are discussed below in terms of potential significant impacts to groundwater resources in the project area.

Construction

During construction, 63 acre-feet of water will be used to hydraulically test the integrity of the pipeline. This water will be provided by water districts; whether it will be supplied from surface or groundwater sources is unknown. It will be used repeatedly to test sections of the pipe until all of the line has been tested and the water is discharged. For comparison purposes, Kern County uses over 1 million acre-feet of water per year. Even in the western portion of Kern County along the proposed route, withdrawals of groundwater are 20,000 acre-feet per year. Thus, the planned 63 acre-feet withdrawal does not represent a significant impact on available groundwater supplies. However, as shown on Figure 3-3, the Kern County sub-basin is subject to overdraft. If the hydrostatic test water is withdrawn from this sub-basin, a significant impact would result if the basin is not recharged.

Impacts on groundwater quality from oil spills during refueling of equipment along the proposed route will not be significant because such spills will be small, will spread on the surface, and will be cleaned up before they impact the aquifers.

Operation

The operation of the proposed project will not significantly impact groundwater because it will not degrade water quality or have any effect on groundwater recharge or volume.

Water for wet fuel injection at the booster stations is required at a rate of 4,000 gallons/day/station or 8,000 gallons/day for the two new stations; i.e., approximately 80 to 115 million gallons over 30 to 40 years. The water will be purchased from the San Luis and Kern Canyon Water Districts based on permit applications. The impact is insignificant because the total water requirement is about 30 acre feet; i.e., less than that required for testing the pipeline.

Accidents

For 5.5 days of the week, the pipeline will be carrying a high melting point oil with low volatiles content and of such high viscosity that it will be almost solid at ambient temperatures. It would not flow far from the point of leakage or spillage through the soil, and downward migration to aquifers would be slow. The maximum impact of a pipeline break will occur only if the break happens while the line is carrying "lube crude," a lower viscosity oil with a higher volatiles content. Impacts are discussed for soils in Section 4.2.3 and for surface water in Section 4.2.4.

Because the depth of the pipeline, which is normally 5 feet, is less than the depth of the groundwater table, which is usually found at 20 feet or more, a spill or leak will first have to penetrate a deep layer of unsaturated soil or rock to impact groundwater. Since the Oil Spill Contingency Plan provides for prompt remedial action, no significant impacts will occur, as elaborated below. A break in a creek would result in contact between the oil- and water-saturated alluvial sediments, but the oil would float at the surface and it would be cleaned up.

Spill volumes probable along each segment of the route are shown in Table 4-6. These volumes are based on the pipeline diameters and topography, assuming that a total break occurs at a point draining the average length of pipe in each case.

In the event of a pipeline rupture with maximum volumes as estimated, the following effects are anticipated (for further information on spill potential, see Section 4.2.15).

From Weir Station to Caliola, i.e., through the first three segments of the pipeline, the groundwater is normally 20 feet deep or more, except that it is seasonally higher at Mid station (Fryer and Cebell 1984; Templin 1984). Water quality is over 1,000 ppm total dissolved solids (TDS); thus, it is not potable. Based on the depth to groundwater and characteristics of the crude, a spill will not impact drinking water and groundwater used for livestock watering and irrigation, provided it is cleaned up and no contaminated oil is left in place.

Along Segment 4, from Caliola to Martinez (approximately 175 miles), the depth to groundwater is generally >20 feet. Through much of this section, the proposed pipeline passes through areas with unconfined aquifers having high levels of TDS. The only areas with potential potable unconfined groundwater resources are the Little Panoche Creek alluvium, the Los Banos Creek alluvium, and close to the delta in Contra Costa County where some of the alluvial fill of the valleys for Kellogg, Brushy, Deer, Sand, and Marsh creeks may contain usable supplies. The only known municipal water wells within 3 miles of the route are those at Brentwood in Contra Costa County, which are used only in emergencies because of their high nitrate content. These wells draw water at depths of more than 100 feet from the surface. Given the depth to groundwater, and because spills will be cleaned up, there is no indication that oil spills of the maximum magnitude possible will result in impacts on aquifers used as municipal drinking water sources.

Abandonment

During abandonment the pipeline will be filled with water. This will require a one-time extraction of approximately 76 acre-feet, an insignificant impact in terms of rate of present withdrawals and

Table 4-6

CALCULATED MAXIMUM CRUDE OIL SPILL POTENTIAL

Sequence	Segment	Diameter (inches)	Maximum Potential Spill (barrels) *	Maximum Oil Spill/ Segment* (barrels) **
1	Weir - Kernridge	10	2,600	3,300
2	Kernridge - Mid	18	17,700	36,000
3	Mid - Kettleman	Loop 14	3,600	4,300
3	Kettleman - Caliola	Loop 14	3,600	
4	Caliola - Valve 1	24	16,000	***
4	Valve 1 - Station 2	24	11,000	***
4	Station 2 - Valve 2	24	8,000	***
4	Valve 2 - Valve 3	24	8,000	***
4	Valve 3 - Station 3	24	11,000	***
4	Station 3 - Valve 4	24	14,000	***
4	Valve 4 - Martinez	24	16,000	24,000

* Assumes a total pipe failure (i.e., unrestricted flow of oil from point of failure) occurring at the average elevation for the line. Spill volume was then calculated based on the drainage from lengths of pipe that were greater than the average elevation, taking into consideration intermediate elevation peaks that would limit drainage. Source: Woodward-Clyde Consultants 1985.

** Worst-case maximum spill for segment is based on residual drainage by gravity following valve closure. Spill location is at the bottom of the longest slope between valves. Source: Ecology and Environment, Inc., 1986.

*** Maximum spills in subsegments of Segment 4 will be smaller than the 24,000 barrels listed for the distance from Valve 4 to Martinez.

supplies. While the groundwater in the western margin of the San Joaquin Valley is not being overdrawn as it is in other parts, conditions may change. The effects would be subject to agency review at the time of abandonment.

The water with which the pipeline will be filled will contain rust inhibitors. In the event of a leak, it would entirely or largely evaporate prior to reaching groundwater aquifers; thus no significant impacts to groundwater quality will occur.

4.2.6 Air Quality

This section discusses the impacts of the proposed project on air quality. The impacts were analyzed in the following manner. An air quality protocol specifying data sources and the specific methodology to be used for the analysis was prepared for review and approval by the appropriate agencies (the Air Quality Protocol is contained in a separate publication entitled Supplemental Air Quality Technical Appendix for the San Joaquin Valley Pipeline EIR/EIS, which is available upon request from the agencies listed in the front of the document). The purpose of the protocol was to make sure that the most appropriate data and state-of-the-art computer models would be used to determine impacts. Next, data required for the analysis including information on emission source locations, terrain elevations, meteorological data, background pollutant concentrations, and project emissions during both construction and operation were collected. These data were necessary to determine what project emissions will be, how they will disperse in the environment, and how they will interact with background pollutant concentrations to either meet or exceed air quality standards. The project-specific impacts were determined by applying several computer models to simulate how project-related impacts will behave in the environment; several different models were used to account for differences in pollutant emissions. These simulated effects were then compared with air quality standards to predict air quality impacts of the project. The specific data collected, models used, and conclusions drawn are discussed below.

Site location data, in Universal Transverse Mercator (UTM) coordinates, and terrain elevations at each computational receptor point were taken from USGS 7.5-minute topographic maps (scale 1:24,000). Source data were used as presented in the protocol. Emission data and building dimensions are project-specific. The emission data include values for the heating equipment at the existing booster and injection stations, as well as for the new stations (SJV-2b and SJV-3b) and the alternates (SJV-2, 3, and 4). The emissions for each scenario are incremental, that is, they are to be added to the "existing" emissions (background).

Meteorological data were supplied by the California Air Resources Board (ARB). Computations for each booster station were made using the meteorological data from the closest weather station. Air quality data were extracted from California Air Quality Data summaries for 1982, 1983, 1984, and 1985 released by the ARB.

Sensitive receptors were identified from the USGS maps. Because few sensitive receptors are present and because the project's emission sources are relatively remote, it was decided that these maps were adequate to identify sensitive locations. Sensitive receptors were found only in the town of Coalinga, near the Caliola station, and are listed in Table 4-7.

Estimates were made of compliance or non-compliance with U.S. and California air quality standards due to project-specific emissions, added to high observed background concentrations. The standards are used as thresholds of the significance of computed impacts. For cases in which concentrations were computed to be in excess of a standard, without project emissions, EPA-approved significance criteria for concentration increases were applied. Conservative values of these significance levels were taken from the Bay Area Air Quality Management District Draft Guidelines (Table 4-8).

Air quality impacts of the proposed action and of several alternatives were estimated using a set of computerized air dispersion models to predict the concentrations of pollutants that would occur. Models used are briefly summarized below.

Pollutants addressed include carbon monoxide (CO), nitrogen oxides (NO_x), ozone, sulfur dioxide (SO_2), total suspended particulates (TSP), and TSP material of less than 10 microns in diameter (PM10). In addition, reactive organic gases (ROG) are evaluated. ROG is not regulated as an air pollutant, but it is an air quality concern.

Modeling of the estimated impacts of non-reactive pollutants (i.e., CO, SO_2, TSP, PM10) was carried out using standard EPA models, with an ARB model designed for analyzing line sources and an ARB model designed for studying "fumigation" impacts. Because high plume impacts sometimes occur as a "fumigation" of an elevated plume to ground level for brief periods (less than one hour) under special meteorological conditions, impacts were also computed with the ARB "PTFUM" model.

Modeling of the construction impacts was done with CALINE 4, a model developed by the ARB for analyzing impacts from extended, linear, ground-level sources such as highways. The construction activity is confined to an 80-foot-wide corridor, with equipment extended over about a 3-mile length at any one time. Data sources for the modeling included the equipment list for a typical construction "spread."

Modeling of ozone impacts was done with two Systems Applications models, PARIS and RPM II-S. PARIS is a model that addresses the formation of reactive pollutant products (i.e., ozone) with detailed plume computations within a background of reactions and dispersion computed on a three-dimensional grid of analysis cells. The computations of the plume become merged, automatically, with the grid cell computations when the plume expands to a size that fills a cell. Grid computations address reactions between plume pollutants, background ambient pollutants, and emissions from all sources in a gridded inventory of all regional sources of NO_x and ROG.

Table 4-7

SENSITIVE RECEPTORS IN THE CALIOLA IMPACT AREA

Site	Coordinates UTM-N	UTM-E	Distance-km from Source
Jr College	737.94	4039.40	13.5
High School	737.43	4003.00	14.0
Hospital	737.31	4003.00	14.0
Cheney School	737.21	4002.75	14.0
Sunset School	737.21	4003.17	14.0
Park	738.54	4002.25	13.5

Source: Systema Applications, Inc., 1986.

Table 4-8

SIGNIFICANCE LEVELS (ppm)
FOR CONCENTRATIONS IN EXCESS OF STANDARD
NOT INCLUDING NEW PROJECT EMISSIONS

	Averaging Time				
Pollutants	1 Hour	3 Hour	8 Hour	24 Hour	Annual
CO	2,000	--	500	--	--
NO_2	--	--	--	--	1
SO_2	--	25	--	5	1
PM10	--	--	--	5	1

Source: Bay Area Air Quality Management District Draft Guidelines.

NO_2 plume impacts are computed with the Ozone Limiting Method (OLM), an EPA method that recognizes the rapid formation of NO_2 from oxidation of emitted NO by contact with ambient ozone.

Construction

The results of construction air quality modeling are summarized in Table 4-9. Table 4-9 shows that construction does not produce any unacceptable or significant air quality impacts.

Operation

This description of operational impacts on air quality first addresses non-reactive pollutants (SO_2, CO, and TSP) and then the reactive pollutants (ozone and NO_2). The results for each of the non-reactive pollutants indicate that several violations may occur based on total impact divided by standard.

A review of the violations listed in Table 4-10, which divides the new impacts from the proposed project by the respective U.S. or California standards to display the share of the project's emissions as a percentage of these standards, shows that the project does not contribute substantially to the violations. The exception is NO_x but the model tends to overestimate NO_x, and EPA model guidelines recommend the use of the Ozone Limiting Method (OLM) when the computed NO_x levels exceed the standard. The OLM was therefore used in analyzing NO_x impacts.

In Table 4-10, all violations, with the exception of the NO_2 violations, are produced mainly by existing emissions and background. All of the SO_2 and TSP violations are primarily due to background concentrations. In each case, the impacts due to the new emissions alone are well below the significance level for incremental effects (see Table 4-8).

In Table 4-10, the impacts for NO_2 are included only to present the very conservative upper limit estimates produced by the EPA model, thus indicating the reason for application of the ozone limiting method based on estimated concentrations of the reactive agents.

The PARIS model results were scanned and ozone concentrations tabulated for each hour of the day at each of 12 regional monitoring stations. The results of the PARIS modeling show that the emissions of Mid station make no significant change (by modeling) in the local or regional ozone patterns.

The highest credible ozone concentration in the presence of NO_2 was determined to be 177 micrograms per cubic meter (ug/m^3). Higher background concentrations of ozone were estimated but not coincidental with NO_x. The ozone limiting method was applied to estimate NO_2 by assuming the "worst case" concentrations of ozone (177 ug/m^3); thermal NO_x as 10% of the computed total NO_2 concentrations (including the project and background levels); and ambient NO_2 at

Table 4-9

MODELED CONSTRUCTION IMPACTS

Averaging Time	Concentrations (ppm) NO_2	CO	SO_2	PM10
1-Hour	0.18	1.73	0.0072	--
3-Hour	--	--	0.065	--
8-Hour	--	1.23	--	--
24-Hour	--	--	0.009	25

Source: System Applications, Inc., 1986.

Table 4-10

ANALYSIS OF VIOLATIONS OF AIR QUALITY STANDARDS
BASED ON TOTAL EMISSIONS
(Existing AND New Emissions)

Pollutants	Averaging Period	Station	New Impacts (ug/m^3)	Percent of Standard
SO_2	Annual	Kettleman	0.04	0.05(1)
	1 Hour	Mid Station	0.16	0.02(2)
		Kettleman	0.89	0.13(2)
SO_2	3 Hour	Kettleman	0.70	0.05(1)
SO_2	24 Hour	Mid Station	0.04	0.01(1)
		Kettleman	0.18	0.05(1)
NO_x	1 Hour	SJV-2b	586.91(3)	124(2)
		SJV-3b	620.52(3)	131(2)
		Caliola	123.4(3)	26(2)
		Kettleman	396.52(3)	84(2)
TSP	Annual	SJV-2	0.00	0.0
		SJV-2b	0.11	0.15(1)
		SJV-3	0.00	0.0
		SJV-3b	0.23	0.31(1)
		SJV-4	0.00	0.0
		Caliola	0.03	0.04(1)
		Mid Station	0.01	0.01(1)
		Kettleman	0.00	0.0
TSP	24-Hour	Mid Station	0.07	0.03(1)
		Kettleman	0.00	0.0

(1)National Standard

(2)California Standard

(3)Extremely Conservative Upper Limits

50 $\mu g/m^3$, as explained in the protocol. The estimates for total NO_2 including background levels are as follows:

at SJV-2b:	285.69 μ/m^3, which is 61% of the standard
at SJV-3b:	289.05 μ/m^3, which is 62% of the standard
at Caliola:	239.34 μ/m^3, which is 57% of the standard
at Kettleman:	266.65 μ/m^3, which is 70% of the standard

Thus, even impacts caused by NO_x are calculated to be below the standard. Therefore, no significant impacts are estimated for the gas-fired operation of the proposed project facilities for any of the reactive and non-reactive pollutants.

Accidents

No air quality impacts will result from oil spills. Fires might result in significant air quality impacts but cannot be calculated.

Abandonment

Abandonment will have a small but insignificant effect on regional air quality by eliminating project emissions.

4.2.7 Socioeconomics and Transportation

The project description presented in Section 2, and particularly the data on the number of construction workers and full-time operation personnel, were analyzed in relation to the socioeconomic setting described in Section 3.2.7. County housing and population, public service and infrastructure capacity, general traffic patterns, tourism, and tax assessment bases were evaluated to determine impacts to socioeconomics and transportation in the project area. The criteria used to determine significant impacts to socioeconomics and transportation are discussed below in the respective subsections.

SOCIAL AND ECONOMIC ANALYSIS

The evaluation of socioeconomic impacts was based on data for the proposed project concerning the number of spreads (self-contained construction equipment and crews), number of construction workers, estimated number of local versus non-local workers, and housing logistics for the construction crews. The local versus non-local composition of the construction work force was verified through an assessment of local skilled/unskilled labor force availability, as well as analyses of relevant literature concerning typical pipeline construction crew composition, such as the Pipeline Construction Worker Profile (Mountain West 1979) and EIR/EISs prepared for other pipeline projects in California. A local worker is one who commutes to and from the construction site from his permanent place of residence on a daily basis. In contrast, a non-local worker is one who moves to the construction area only for the duration of the project.

Construction of the proposed project is scheduled over a year-long period, between mid-1987 and mid-1988. Construction will involve the use of two mainline spreads, each consisting of 130 to 200 workers, as well as two mini-spreads, each consisting of approximately 30 to 50 workers. One of the mainline spreads will essentially construct pipeline Segments 1 to 3 (i.e., the 84.5 miles from Weir station to the Caliola station), while the other will cover pipeline Segment 4, from the Caliola station to the Martinez refinery. The mini-spreads will be used to construct the pipeline through two areas where mainline construction would not prove effective because of congestion; these include the oil fields near Kernridge and the more developed areas near Martinez.

In addition, the construction of two new booster stations (SJV-2b and SJV-3b) and the modification of four existing booster/injection stations, as well as the construction of a meter station at Martinez, will proceed independently of pipeline construction, and is expected to require 10 months. The maximum construction work force for each of the booster/injection stations is 45 persons. Construction of the Martinez meter station will require a maximum of 30 personnel.

Operation of the project will require the employment of 10 to 12 full-time personnel who will be needed to operate and routinely maintain the new system.

Impacts are considered significant if construction and operation of the project would result in the following criteria being exceeded:

- Demand for temporary housing in excess of the existing supply (based on current occupancy rates); unavailability of housing accommodations within a commuting distance of 100 miles (roundtrip); or demand for permanent housing representing 5% or more of the projected vacancies in any one area.

- Permanent estimated demand on infrastructure facilities in excess of 25% of the current level of demand, or temporary demand in excess of existing capacity in the areas where the work crews would live.

- Permanent estimated increases in water demand of 2% or more in areas where total water supplies are fixed.

- Projected negative changes in local tax bases of greater than 10%.

- Projected changes in local area population in excess of 10% in any one year.

- Projected negative long-term changes in property values of 10% or more.

- Projected shifts in the economic contribution of employment sectors (in relation to total regional or local employment) of 10% or more for any given sector for a period of one or more years.

- An accident, such as fire or explosion, which could be fatal or cause injuries to the general public, creating an unacceptable level of public risk.

- Relocation of residents is required, or the character of a neighborhood is permanently altered.

- Projected loss of more than 10% in tourist revenue, either on a temporary or a permanent basis.

- A loss of more than 10% (temporary or permanent) in revenues to livestock permittees on BLM lands.

The impacts are described for the various phases of the proposed project on population, employment and income, housing, infrastructure facilities, and revenue. Affected communities were identified along the pipeline route based on commuting distance, access, driving time, and housing availability, as well as the review of the construction schedule and worker housing plans.

Construction

The construction of the proposed project will have a minor, temporary effect on socioeconomic conditions in the eight-county project area. As described below, this is primarily because of the comparatively small number of non-local workers who would be involved in the project, as well as the quick pace and short duration of the overall construction schedule and the availability of the existing infrastructure and housing facilities to temporarily accommodate the workers.

The socioeconomic impact evaluation is predicated upon a worst-case scenario in which the potential maximum peak construction work force for pipeline construction will be 800; i.e., assuming the following:

- Construction activities occur ar the same time.

- A maximum number of 200 workers are employed on each mainline spread, 50 workers on each mini-spread, 45 at each booster/injection station, and 30 for the construction of the Martinez meter station.

- Only 15% of the non-local workers bring their families because of the short construction periods (SLC/BLM 1984), and they will be more likely to occupy rental units or recreational vehicles/campers than rent hotel/motel rooms.

Of the eight counties traversed, all but Alameda and Contra Costa counties exhibited recent high (double-digit) unemployment rates (see Table 3-21 in Section 3.2.7). Since this local labor force is available and the project is committed to using local labor, it is expected that at least 50% of the construction work force will be drawn from this existing local labor pool. Under this assumption, a maximum of 400 non-local workers will temporarily relocate to the eight-county project area during the construction period.

The non-local construction labor force will be composed principally of skilled workers who will remain in the project area only for the duration of construction. However, because one of the two main-line construction spreads will begin construction at the southern end of the route and proceed north, while the other begins in the north and proceeds south, a maximum of 200 non-local workers will be in any one construction location during most of the project. The only point at which all 400 non-local workers could be based in approximately the same construction area will be when the two construction spreads meet to join Segments 3 and 4 of the pipeline in Fresno County.

The overall effect of the temporary relocation of construction workers on the project area population is insignificant, considering the eight-county project area's current combined population of almost 4 million (see Table 3-21 in Section 3.2.7), and the availability of transient lodging and infrastructure within 50 miles (one-way) of the proposed route.

The construction workers will be housed primarily in motels/hotels and mobile home parks within daily commuting distance (100 miles roundtrip) of the proposed route. The location of the workers' transient lodging will change periodically as construction proceeds along the proposed right-of-way at an average rate of 6 miles per week. It is expected that the workers will be housed between 4 and 12 weeks at any one location; the specific time will depend on housing availability, commuting time, and the exact length of time for particular construction tasks in each area.

Most of the maximum 400 non-local construction workers are expected to prefer to live as close to the pipeline route as possible. Based on previous analyses (BLM 1984), it is assumed that the non-local work force will select various temporary accommodations according to the following breakdown: motel/hotel (42% or 168 workers); rental units (26% of 104 workers); recreational vehicles/campers (28% or 112 workers); and other (4% or 16 workers).

Table 4-11 projects the length of time that construction would occur in any of the counties (based on this daily rate and the miles of the route within each county) and identifies the availability of transient lodging to construction workers. The availability of lodging was estimated on a conservative basis, using only a 50-mile distance from the proposed route and using only facilities rated by the AAA (see Section 3.2.7).

As Table 4-11 shows, lodging facilities are extensively available along all of the route with the exception of Kings, Merced, and Stanislaus counties. However, these areas are within a 100-mile roundtrip commuting distance from large communities like the cities of Hanford, Fresno, Modesto, and Stockton, where lodging is available. With the exception of Alameda and Contra Costa counties, county-wide vacancy rates are all above the 5% rate generally considered to be indicative of adequate housing availability. Moreover, the lodging

Tabla 4-11

SUMMARY OF SOCIOECONOMIC DATA FOR CONSTRUCTION OF THE PROPOSED PROJECT

County	Total Miles of Pipeline per County	Project Construction Period per County* (in weeks)	Principal Communitiaa (Community Population) 50 Milea of the Proposed Routet	Lodging Facilitiea: Total Available Hotel/Motal Rooma Within 50 Milas	Lodging Facilitiea: Rooms Available to Construction Workerstt	Total Housing Unita	1986 Vacancy Rate	Available Housing Unita
Kern	44	7.3	Bakersfield (105,600) Taft (6,100)	2,200	440	165,959	9%	14,936
Kings	27	4.5	Avenal (4,540) Hanford (21,000) Kettleman City (1,051)	500	100	29,000	7%	2,030
Fresno	65	10.8	Coalinga (7,671) Fresno (218,200) Mendota (6,062)	3,300	660	60,000	5.9%	3,540
Merced	35	5.8	Los Banoa (12,100) Merced (36,500)	300	60	55,091	9.3%	5,123
Stanislaus	30	5.0	Patterson (4,000) Modesto (106,100)	780	156	116,049	7%	8,123
San Joaquin	15	2.5	Stockton (149,800)	1,250	250	156,053	7%	10,924
Alameda**	5	0.8	Hayward (94,200) Livermore (48,300)	1,319	264	475,252	3%	14,258
Contra Costa**	37	6.2	Antioch (43,600) Concord (103,300) Martinez (22,600)	1,234	247	278,400	3%	8,352

*Based on an expected average construction rata of 6 milea per week, and on a six-day work week.

**Includes only those lodging facilities in communities nearest the proposed route; 3.7 million rooms available within commuting distance of the project.

†List includes communities in which workers would most likely live during the construction period.

††Assumes a conservative occupany rate of 80% (instead of the 65% listed for the project region) and assumes that only the remaining 20% of the rooms would be available to construction workers. This conservative approach was taken to account for potential conflicts with tourism during select periods of the year.

Source: Compiled by Ecology and Environment, Inc., 1986.

supply is not static but will increase by about 5% during 1986 and again during 1987. Sharing motel rooms is not uncommon. The impact will be beneficial on the economy of the lodging industry.

In summary, as Table 4-11 shows, in the areas in which the non-local construction crews would be expected to be housed, the temporary population increase during the construction period will be well below the significance criteria of a 10% increase. On a regional basis, construction workers, tourists, and migrant farm workers will not seriously compete for lodging because of the availability of housing and transient lodging facilities. (On an individual basis, tourists, migrant farm workers, and pipeline workers will compete for lodging in some motels along I-5 but in general the demand will affect lodging in different price categories.) Tourists may prefer to bypass sections where construction is in full progress. Because of construction activities in some areas, late arrivals without reservations may not find lodging in motels nearest to the pipeline and will be required to search for other lodging. This is an inconvenience impact and is insignificant because the demand for temporary housing will not exceed supply in any area.

The construction work force for the pipeline will utilize the existing infrastructure facilities and services in the communities in the project area. Based on consultations with local and county officials, none of the construction spreads is large enough to result in temporary demands in excess of the current capacity on community infrastructure facilities and services, such as water/sewer systems, police service, medical facilities, and fire or educational services. Moreover, the construction work force will not cause an increase in water demand of 2% or more in any of the locations in which the workers will be housed. This is because the temporary work force will not constitute more than 2% of the population in any one area. The construction workers would be expected to use a maximum amount of about 100 gallons of water per day; thus in any one location, the incremental water usage increase (attributed to the maximum of 200 non-local workers) would be 20,000 gallons of water per day. Likewise, the construction population will not cause any long-term adverse effects to community social well-being due to the transient nature of the construction process. Thus, no significant impacts to the existing infrastructure in the project region will occur.

Because the construction period will be short and 50% of the workers will be drawn from the local labor pool, and because of the large economic base of the eight-county region, there will be no shift in employment of 10% or more in any economic sector; as a result, no significant employment impacts will occur from the pipeline construction. Because adequate temporary housing is available, any loss of tourist revenue will be far less than 10%. No significant air impacts will result from the proposed project, and increased noise and dust, even near recreation areas, will be so temporary that they will not affect the project area's attractiveness to tourists. In fact, the income earned by the construction workers could help stimulate some of the economies along the pipeline route, causing positive multiplier (indirect) effects in terms of employment and income. The estimated average daily wage would be about $205 per worker; overall, about $40 million will be spent on wages and salaries during the construction period.

Local workers are expected to spend most of their wages in the project region, whereas, based on previous analysis, non-local workers can be expected to spend approximately 37% of their wages (i.e., about $76/day) on local goods and services, such as food, clothing, and entertainment. These increased expenditures will have positive, short-term effects on local retail sales and indirect employment, as well as on sales tax revenues.

Similar positive effects will result from the local purchase of an indeterminate amount of supplies and materials for the pipeline construction by the contractors. Such supplies and materials could include fuel, equipment parts, and tools.

The construction of the pipeline will not cause an unacceptable level of public risk, given that the route has been aligned through sparsely populated portions of the eight-county project region. Moreover, standard safety measures to be employed during construction will further minimize the risk to the public (see Sections 2.1 and 4.2.14).

The single exception is an area near the northern terminus of the route east of Interstate 680 where the pipeline will be constructed adjacent to a residential subdivision for about 3,500 feet. Although the safety measures employed during construction will be adequate to protect the responsible public from accidents, additional measures are necessary to safeguard curious children attracted to the construction in the neighborhood (see Section 6.1.6).

In regard to socioeconomic effects on livestock permittees, the construction of the project will affect a total of 22.3 acres of BLM land (see Table 2-3); this acreage includes separate parcels in both Kern and Kings counties. Because of the small grazing acreage involved overall and in each county and the fact that construction activities will incorporate practices to avoid direct impacts to livestock (see Section 2.1.2), the livestock permittees will not suffer a temporary revenue loss of 10% or more and, as a result, no significant impacts will occur.

Construction through cultivated agricultural areas will result in a loss of revenues associated with the temporary removal of the area along the right-of-way from production. However, the resulting impacts will not be significant because of the comparatively small width of the construction right-of-way (80 feet) and the compensation of landowners for crop losses depending on their right-of-way agreements.

Operation

Operation and maintenance of the project will require the employment of approximately 12 people. These people are presently employed by Shell in the San Joaquin Valley and would be transferred to the proposed project. Thus, no increase in population or employment will result. Because of this, the operation of the project will not result in permanent demands in excess of 25% of the current level of demand on local infrastructure facilities and services, and will not cause any adverse socioeconomic impacts. The total wages and salaries for operation and maintenance personnel are about $900,000 annually.

The operation and maintenance of the project will not cause significant adverse socioeconomic effects on the value of land within the right-of-way or adjacent to it. This is because most of the proposed route is aligned adjacent to existing transportation corridors and through cultivated agricultural areas or rangeland, which will continue to be used for such purposes after the completion of construction (see also Sections 3.2.9 and 4.2.9). Thus, the overall economic use of the properties will not be impaired.

The project will have no effect on tourism in the project area. It will not result in significant air quality impacts. Noise will have no significant impacts on tourism, because the booster/injection stations are remote and the surrounding land uses do not attract tourists. The impact on visual resources is not significant over the long-term and not of a scale that would have a measurable effect on tourist revenues.

The project will have a long-term positive impact on local property tax revenues, since taxes will be collected for both the pipeline and its associated ancillary facilities. The pipeline will be assessed on a full-cost basis for the first several years following construction, and thereafter on the basis of earnings to users. The total estimated cost of the pipeline and associated facilities is $110 million; however, the cost within each county is a function of the pipe diameter and the type and number of ancillary facilities. The potential significance of the increased tax revenues will vary from county to county, since the amount of taxes paid will depend on the length of the pipeline right-of-way (as a percentage of the total right-of-way) and the number of associated facilities within each county (as well as on local tax rates). The magnitude of the positive impact of such tax revenues to each county will depend on the current total county assessment and the project's percentage effect on this assessment (see Table 4-12).

<u>Accidents</u>

The potential social and economic effects of oil spills will be a function of the spill location, spill magnitude, and adjacent land uses. Socioeconomic impact significance criteria will not be exceeded by an oil spill because, even in a worst-case situation, an oil spill will have only short-term limited effects in terms of influx of population, laborers, and housing infrastructure requirements. If a worst-case spill were to occur in a sensitive land use area (e.g., cultivated cropland, water supply source, urbanized areas), the social and economic effects in terms of lost crop value/productivity and property damage could be substantial on an individual property or site-specific basis. The SJVPLC will be responsible for containment,

Table 4-12

SUMMARY OF ESTIMATED PROJECT IMPACTS ON PROPERTY TAX REVENUES

County	Project Facilities		Estimated Value of Pipeline and Facilities (thousands $)†	Total Countywide Assessed Valuation* (thousands $)	Projected Annual Ad Valorem Tax Revenues (Based on 1.1% tax rate) (thousands $)
	Miles of Pipeline	Associated Facilities			
Kern	44	McKittrick Station (M) Kernridge Section (M) Mid Station (P)	$19,495	$32,000,118	$214
Kings	27	Microwave Tower (1)	7,660	2,465,736	84
Fresno	65	Caliola Station (M) SJV-2 (P) Microwave Towers (4)	28,250	18,808,586	311
Merced	35	Microwave Towers (2)	13,500	4,496,146	149
Stanislaus	30	SJV-3 (P) Microwave Towers (2)	16,100	8,696,880	177
San Joaquin	15	N/A	5,700	12,227,683	63
Alameda	5	N/A	1,900	39,875,839	21
Contra Costa	37	Martinez Meter Station Microwave Towers (2)	18,760	32,423,464	206

Key: M = Modifications to existing station
P = Proposed (new construction)

*1985-1986 data

†Value estimated based on the following projected average construction costs:

- Pipeline 10.75 inches = $315,000/mile
  14 inches = $280,000/mile
  18 inches = $360,000/mile
  24 inches = $380,000/mile
- Booster station = $4.5 million
- Microwave station = $100,000

Totals not exact due to rounding

Source: California Board of Equalization 1986; San Joaquin Valley Pipe Line Company 1986 cleanup, and compensation to insure that this impact is mitigated at the individual property level and, for this reason, the impact to socioeconomic conditions and resources of the local municipalities is not considered to be significant over the long-term.

Other public safety considerations are evaluated in Section 4.2.14, System Safety and Reliability. The oil itself is not considered to be a fire hazard due to its chemical characteristics. Therefore, fire hazards will be limited to the use of natural gas and diesel as fuels. The booster stations are located in remote areas, and the fire protection and security systems to be employed by the project will be adequate to contain any fires within the property boundaries. Therefore, the population at risk from the proposed project consists primarily of employees who are present on site at the time of an accident, and the impact on the public at large is negligible. (Assuming standard operating procedures, the probability rate of fatalities will be less than 0.000001 per person per year for the population in the project region.)

Abandonment

The abandonment of the pipeline in-place and the dismantling of above-ground facilities will not result in any significant socioeconomic impacts. This is because the activities required to decommission the pipeline system will involve a substantially smaller labor force than would be required to construct the entire pipeline, which, it has been shown, will not cause significant adverse socioeconomic impacts. It is estimated that no more than 45 workers--the number required to construct a booster or injection station--will be required to dismantle the same facilities. Fewer workers are needed to remove the microwave stations and other ancillary facilities. These workers will be housed in the same general locations as the construction workers, where lodging and infrastructure facilities have full capacity to support them.

Any loss in tax revenue as a result of abandonment of the pipeline system will not amount to a significant decrease (i.e., over 10%) in any of the eight counties' tax base (see Table 4-12). As a result, the abandonment of the system does not constitute a significant tax impact.

TRANSPORTATION

The primary transportation impacts associated with the proposed project involve potential disruptions of traffic during construction, either on roads crossed directly by the pipeline or on roads used by the construction work force to access the construction site. Potential traffic disruptions include decreased levels of service, congestion, or delays. Disruption of traffic flows are considered significant if the following criteria are met:

- Traffic increases as a result of the project cause a long-term change in the level of service (LOS) of a highway, or a change in a LOS lasting more than three months during the construction phase;

- Traffic delays as a result of pipeline construction are more than 30 minutes on minor arterials during low-use periods and more than 15 minutes on principal arterials and major collectors;

- The project has permanent impacts to roads, rail networks, other pipeline systems, or electrical power transmission systems; or

- Pipeline construction causes delays or precludes emergency access across any portion of the pipeline corridor.

Construction

The construction of the proposed project will involve the movement of equipment, supplies, and manpower to the right-of-way and proposed sites of ancillary pipeline facilities. Major pieces of construction equipment will be moved to the right-of-way at the beginning of each spread; this equipment will then proceed along the right-of-way in a linear fashion until construction is complete. Similarly, major construction equipment will be moved to the proposed locations of the ancillary facilities and will remain on-site until construction activities are finished. Resultant traffic delays are not likely to exceed the 15- or 30-minute thresholds. Manpower and supplies, on the other hand, will be transported to and from the right-of-way and ancillary facility sites on a daily basis. For example, it is estimated that about 3,300 truck loads will be required to transport pipe from pipe storage areas to the construction right-of-way.

The principal transportation impacts as a result of pipeline construction activities will be associated with the daily movements of manpower and supplies to the right-of-way, as well as potential disruptions to traffic flow from pipeline construction across roads. Impacts will also occur as a result of the daily movement of construction personnel and supplies to the ancillary facility sites.

The entire project area is easily accessible via a system of existing roads. These existing roads will be used to access the right-of-way, which will serve as the primary access way for all construction activities.

The construction workers will travel by private automobile from their lodgings to the nearest access point to the construction area. Vehicles will be parked along the pipeline right-of-way, away from public roadways. On an average day during peak construction, a maximum of 800 construction workers could drive to the pipeline right-of-way or ancillary facilities using the nearest major roadway to the construction site. Assuming a worst-case of one private vehicle for each worker, this will result in a total of 800 additional automobile movements. However, these vehicle movements will be spaced out along the pipeline route in accordance with the location of the various spreads and the specific work locations within the spreads, as well as the locations of the ancillary facilities. As a result, a maximum of

200 workers will drive to the right-of-way in any one location. This is a worst-case assumption because the applicant estimates that 60% of the workers will be transported to the right-of-way by bus.

The construction workers are expected to commute to the site(s) between 6:30 and 7:30 a.m., and to leave the site(s) between 4:30 and 5:30 p.m. The routes used by the crews will differ since pipeline construction activities will not remain in any one location along the right-of-way for longer than an average of 20 days.

To predict the impact of project construction on local traffic flow, average daily traffic (ADT) volumes on several roads along the route that are representative of those that will be used to access the right-of-way were evaluated. Along the northern portion of the route in San Joaquin County, Interstate 580, a four-lane highway, has ADTs of 15,000 to 38,000 and Interstate 205, a major four-lane access road to Interstate 580, has an ADT of 23,000; in contrast, Coral Hollow Road (two lanes) has an ADT of 800. Traffic volumes are smaller on roads in the southern project area; e.g., in Fresno County, Interstate 5 (four lanes) has an ADT of about 15,000 and State Route 145 has an ADT of 3,000. From these data, it is evident that construction crew/equipment movements on major roads will have no effect on the level of service (LOS), since the maximum of 800 daily vehicle movements (400 to the construction sites and 400 from the sites) will constitute less than 5% of the existing ADT volumes. However, on local two-lane roads where ADTs are relatively low, the additional traffic movements could constitute 27% to 100% of the current volumes under worst-case conditions. The exact impact of the additional traffic on the LOS on these roads will depend on the timing of construction-related movements compared to the current movements, and the overall capacity of each road. However, because of the short construction period in any one location and the number of different roads available to access the right-of-way (especially Interstates 5 and 580), even if the LOS were to be adversely affected, this change would not last more than three months. In addition, delays of greater than 30 minutes on arterials or 15 minutes on larger highways will not occur. As a result, the impact of the project on transportation will not be significant.

The proposed route will cross approximately 15 major state and federal highways (see Table 3-23), as well as numerous minor public and private roadways. To avoid traffic delays or preclude any limitation on emergency vehicle access, these major road crossings will be bored and traffic flow will not be interrupted. Some construction activities may occur within the major road rights-of-way, but will be planned so as not to interrupt traffic flow on the roadway itself.

Some smaller county or private roads may be open-cut and may require traffic controls, such as the use of proper signing, barriers, or flagmen. However, temporary access will be provided across or around any roads on which service will be temporarily interrupted. Some traffic congestion could occur in these areas for the duration of the construction period. However, emergency access will be provided, either by access roads across the trench or minor detours around the open-cut area. Delays exceeding the threshold criteria are not expected. Therefore, the impacts are judged to be insignificant.

Slow-moving heavy construction equipment will be moved to the right-of-way via the major highways along the proposed route. As noted previously, once on the pipeline right-of-way, this construction equipment will move sequentially along the right-of-way for the duration of the construction period. Thus, the only potential for interruption of traffic flow will occur at highway crossings as the equipment moves across the roadway. During the movement of the heavy equipment on and over highways, some congestion will occur. This will result from the need to stop traffic to allow for the crossing of heavy equipment as well as the need to reduce traffic speeds of cars following the heavy equipment along the roadways. Precautions, including flashing lights, flagmen, and signing, will be implemented to ensure that operations within the highway right-of-way are conducted in a safe manner. However, these interruptions will occur infrequently. No long-term impacts will occur to roads, rail networks, other pipeline systems, or electrical power systems as a result of the construction of the pipeline, since all appropriate measures will be taken to insure that these facilities remain operational during and after construction (see Section 2.1).

<u>Operation</u>

The operation and maintenance of the project will not have any impact on transportation patterns since the 10 to 12 workers who will be permanently assigned to the project are already based in the area.

<u>Accidents</u>

If an oil spill occurs adjacent or underneath a road or highway, the event could endanger the public and cause traffic delays. This impact may be significant if it occurs, but is not considered to be likely.

<u>Abandonment</u>

The abandonment of the proposed system will not result in any significant impacts on transportation for the same reasons as described above for construction.

4.2.8 Noise

Noise impacts were evaluated by qualitatively predicting the intrusive effect of construction noise and booster/injection station operating noise on the existing noise environments along the proposed route as described in Chapter 3. The analysis took into account the timing, magnitude, and duration of noise, and the number of people potentially affected by it. Construction noise levels were estimated based on standard data on construction equipment noise ranges used in similar EIR/EISs and in EPA publications, and took into consideration the noise mitigation techniques that will be specifically incorporated as part of the project (see Section 2).

Significance criteria were derived from regulatory standards (which take into account the number of receptors in a given area, as well as the time of day) and research information. Noise impacts are significant if they:

- Exceed the guidelines specified in county or city noise elements or other local standards on a long-term basis or for sensitive land uses/receptors on a short-term basis;
- Result in long-term inconsistencies with the State of California's land use compatibility criteria for community noise; or
- Exceed (on a long-term basis) a day-night average noise level of 55 dB(A), the level considered by EPA to be the maximum level that will not interfere with speech or other activities in outdoor areas.

Any project-related noise (construction or operation) that meets the most stringent of the above criteria was determined to be significant. Noise impacts from project construction, operation, accidents, and abandonment are discussed below.

<u>Construction</u>

The construction of the proposed project will result in minor and short-term noise impacts in most areas. This is because most of the route has been aligned through sparsely populated areas where few noise receptors are present; and because the construction activities in any one location will be temporary (as work will proceed sequentially along the right-of-way) and will be limited to the daytime, when noise sensitivity is less. The following discusses the basis for the non-significance determination for noise impacts along most of the route and identifies the areas where impacts would be significant.

With the exception of the three counties along the northern portion of the proposed pipeline route, most of the areas crossed by the route are predominantly rural or agricultural, with generally few noise-sensitive receptors such as residences. On the other hand, the northern portion of the pipeline, especially in Contra Costa County, will traverse suburban areas which are particularly sensitive to noise but where the existing ambient noise levels are much higher than in the rural environment. High noise levels prevail, particularly where the proposed route is aligned parallel and adjacent to major highways such as I-5 and I-580. Next to major freeways, the ambient noise environment is estimated at close to 90 dB(A) as a result of normal traffic (see Figure 3-4 in Section 3.2.8).

In the immediate vicinity of project construction, the incremental noise effects will be a function of the existing noise environment as well as the noise generated by construction equipment and any necessary blasting (see Section 4.2.1); the location and sensitivity of nearby land uses to such noise; and the timing and duration of noise-generating activities. The intrusive noise effect will also depend on the distance of the construction activity from the receptor, since noise levels diminish by at least six decibels per doubling of distance from the source.

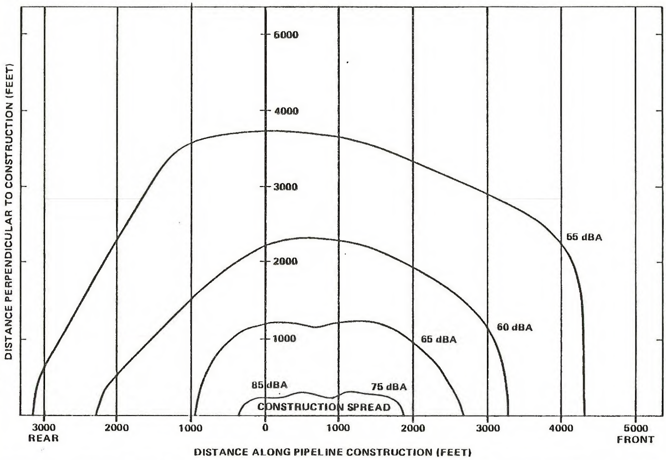
A typical noise generation profile for pipeline construction activity is illustrated in Figure 4-1. This noise profile for typical construction activities can be superimposed on the existing noise environments along the route (see Figure 3-4 in Section 3.2.8) to evaluate the noise impacts as a result of construction. As these figures show, the areas within about 2,000 feet of the pipeline construction spread can be expected to experience noise levels of 65 dB(A). These are less than the noise levels currently experienced in the more developed areas in the northern portion of the route and substantially less than the sound levels attributed to freeways [i.e., about 90 dB(A)]. While 65 dB(A) is about 20 dB(A) more than the noise levels typical of the rural agricultural areas along the southern portion of the route, there are few noise-sensitive receptors in these areas. Moreover, beyond about 3,000 to 4,000 feet from the construction area, the noise level will diminish to close to ambient levels (see Figure 4-1).

Because most of the proposed pipeline route is aligned through unconsolidated rock which can be ripped or excavated, blasting will rarely be required. Small parts of Contra Costa County, the eastern part of Alameda County, and a small section in the northern part of Merced County contain rock formations which may require some blasting. While the sound caused by such blasting will exceed the local standards, the noise impact is brief and almost instantaneous. Moreover, blasting (like all construction activities) will only be performed during the day when noise sensitivity is low. Because the duration of blasting-related noise will thus be extremely localized and short-term, no significant impact will occur.

Several areas along the route do contain sensitive land uses which will be adversely affected by construction activities, even on a short-term basis. This is because the receptors are particularly close to the proposed route or because the route passes through areas that have been identified as particularly noise-sensitive. Table 4-13 lists the areas which are sensitive to noise and will be impacted significantly by construction noise.

Operation

The increases in noise from the operation of the proposed project will be geographically restricted to the vicinity of the pump and heater (booster) stations. The impacts of booster station noise emissions were modeled using a worst-case scenario of flat terrain with no barrier effects and no equipment directivity effects (i.e., no consideration for the fact that equipment typically generates sound that travels in various directions) (see Table 4-14). It should be noted that actual noise impact levels will depend on the placement of the station on the site, the terrain, and site design features.



SOURCE: Getty, 1983; Modified form BLM Final Environmental Impact Statement, Crude Oil Transportation System: Valdez, Alaska to Midland Texas, Chapter 8.

Figure 4–1 NOISE LEVELS FROM SUBURBAN PIPELINE CONSTRUCTION SCENARIO

Table 4-13

NOISE-SENSITIVE AREAS SIGNIFICANTLY IMPACTED BY CONSTRUCTION

County	Noise Sensitive Area	Proximity to Pipeline (miles)	Construction Noise[1] Level from Profile dB(A)	Standards or Guidelines Exceeded
Kern	Lost Hills Park Lost Hills School	0.5 0.5	55-60	EPA[2]
Kings	Kettleman City Fishing Access	0.3	60-65	California[3] and EPA
	Town of Kettleman City	0.5	55-60	EPA
Merced	San Luis Reservation State Recreation Area	Crosses	55-85	California and EPA
San Joaquin	Tracy Golf Course	0.2	60-65	California and EPA
Alameda	Bethany Reservoir State Recreation Area	Crosses	55-85	County,[4] California, EPA
Contra Costa	Municipal golf course	0.3	60-65	County, California, EPA
	Contra Loma Regional Park	Adjacent	65-75	County, California, EPA
	Stoneman Park	Adjacent	65-75	County, California, EPA
	Residential Area	Adjacent	65-75	County, California, EPA

[1]Actual levels measured on a typical construction site are profiled in Figure 4-1.
[2]EPA = Maximum sound level of 55 dB(A) that will not adversely affect public health.
[3]California = 60 dB(A) maximum exterior noise exposure guidelines for county plans.
[4]County = From individual County Noise Element Plans.

Source: Compiled by Ecology and Environment, Inc., 1986.

Table 4-14

PUMP/HEATER STATION NOISE IMPACT MODELING RESULTS*

Case	Condition Modeled	Distance from Facility Center (in feet) to Noise Level Contour				
		70 dBA	60 dBA	50 dBA	40 dBA	30 dBA
1	(3) 2,500-hp electric motor driven pumps	550	1,300	2,600	4,700	7,500
2	(2) 3,500-hp gas-turbine driven pumps	NA**	200	600	1,650	4,000
3	(2) 30 mmB/hr heaters	NA	280	800	2,100	4,800
4	Case 2 plus one heater	NA	280	800	2,200	5,000
5	Case 1 plus case 3	550	1,300	2,600	4,800	8,000
6	(3) 5,000-hp electric motor driven pumps	720	1,550	3,000	5,500	8,800

*Model employed: ERTNOI, ERT's proprietary multiple point source noise propagation model.
**Not available.

Modeling Assumptions:

- Flat terrain, no barrier effects.
- No equipment directivity effects.
- Electric motor-driven pump combinations use high efficiency motors; drive speed less than 1,600 rpm; no enclosures.
- Heaters are natural draft, unsilenced units.
- Gas turbine driven pump units have inlet silencers only; with heat recovery system; NEMA D specification assumed.
- Atmospheric conditions are based upon a "standard day" of 15 degrees C (59°F) with 70% relative humidity; results represent long term average values. Daily and hourly differences will exist due to wind and temperature gradients which can result in increases or decreases in noise levels.

Source: ERT.

Eight stations are proposed for the project, including two new stations; two existing stations, to remain unchanged; and four existing stations scheduled to be modified. The new stations (SJV-2b and SJV-3b), as proposed, would utilize 1,800-horsepower gas turbine pumps. As indicated in the noise impact model, these pumps would be expected to generate noise levels less than 60 dB(A) at 200 feet from the station. This noise impact exceeds the threshold of 55 dB(A) and is significant by EPA standards. However, these stations are located in remote locations which are not particularly noise-sensitive land use areas or near noise sensitive facilities such as schools and houses, and no mitigation is necessary.

Of the stations proposed for modification, pump horsepower increases will occur at three. The McKittrick station will have a 600-horsepower increase using an electric motor driven pump which would be expected to generate noise levels under 60 dB(A) at 1,300 feet from the station. At the Mid station, pumping horsepower will be increased by the addition of a 2,500-horsepower gas-turbine-driven pump. Again, noise levels would be expected to be less than 60 dB(A) 200 feet from this station. Finally, modifications at the Caliola station would increase horsepower by 1,800 using a gas-turbine-driven pump. Noise levels no higher than 60 dB(A) would be expected 200 feet from this installation. These stations will also have a significant impact by EPA standards [i.e., in excess of 55 dB(A)], but their remote location away from noise-sensitive land use areas mitigates the impact.

Accidents

Noise from an accident, such as an explosion at a booster station, would be a short-term, isolated, and unlikely occurrence. Because no sensitive receptors are nearby, no significant impacts will occur.

Abandonment

The abandonment of the project would result in a positive impact on the ambient sound environment since the booster/injection station operations would cease and the pre-construction noise environment would be restored. A localized, but insignificant, impact on noise would occur as a result of dismantling the above-ground facilities. This impact would be less than identified for the construction of the proposed project, since only the above-ground facilities would be affected.

4.2.9 Land Use and Recreation

Land use regulations and plans as well as existing and future land uses were examined for the project area, and comparisons of the proposed action's compatibility to these plans and uses were made in order to assess the project's impacts to land use and recreation. The effect that project construction and operation would have on opening up previously inaccessible areas to off-road vehicles and of discarding construction spoil and debris in nearby landfills was examined. In addition, the project's impacts on recreational areas were evaluated using the data developed in Section 3.

The following impacts were considered significant:

- The proposed action is inconsistent with land use plans adopted by local or regional agencies along the right-of-way;

- The proposed action disrupts or divides the physical arrangement of an established community;

- The proposed action converts prime agricultural land to a non-agricultural land use;

- Total recreation demand in the vicinity of the pipeline increases by 10% or more over existing demand, or exceeds the capacity at any facility;

- The quality of recreational activities decreases because of noise, visual intrusions, or loss of land area to project facilities;

- The pipeline right-of-way provides access to previously inaccessible, environmentally sensitive areas; or

- Expected volumes of waste from pipeline construction exceed 5% of the existing capacity of the landfills identified in Section 3. This would adversely affect the ability of local landfills to accept routine waste from other sources.

The following analysis discusses construction, operation, accidents, and abandonment impacts to land use and recreation from the proposed project along the entire route. A more detailed county-by-county discussion of local land use and recreation impacts is summarized in Table 4-15.

Construction

Existing land uses traversed by the proposed pipeline are shown in Table 4-16. Land use impacts during construction of the pipeline include the short-term disruption of existing land uses along the 80-foot right-of-way. Construction in agricultural lands will result in the loss of crop production along the corridor. However, after the completion of construction, the right-of-way will be returned to agricultural use. Similarly, construction through rangeland will result in the loss of productive grazing use along the right-of-way during the construction period. This impact will not be significant since the total amount of rangeland affected (1,726 acres) is small in terms of its capacity to support grazing, and the right-of-way will be restored and maintained as rangeland after completion of construction.

Impacts on industrial and commercial areas during project construction are expected to be insignificant. Dust, noise, and traffic congestion may cause temporary inconvenience. The pipeline passes through 13 miles of industrial/commercial lands in Kern, Kings,

Table 4-15

SUMMARY OF DETAILED PROJECT EFFECTS AND IMPACT SIGNIFICANCE, BY COUNTY

Feature/Location	Comments	Impact Significance*
<u>Kern County</u>		
Derby Acres Park (milepost 2)	Not crossed; 1 mile from ROW; general construction impacts**	NS
BLM Lands (mileposts 2, 5, 8)	Soils, grazing, wildlife, cultural and visual resources	NS
Town of Derby Acres (milepost 3)	Not crossed; 0.5 miles from ROW; general construction impacts**; future development factor	NS
Lost Hills School (milepost 31)	Not crossed; 0.5 miles from ROW; general construction impacts**	NS
<u>Kings County</u>		
Kettleman City Fishing Area (milepost 63)	Not crossed; 0.3 miles from ROW; general construction impacts**	NS
Town of Kettleman City (milepost 63)	Not crossed; 1.5 miles from ROW; general construction impacts**	NS
Industrial/Commercial Areas (milepost 61-63)	Not crossed; general construction impacts**	NS
BLM Land (milepost 70)	Soils, grazing, wildlife, visual resources	NS
<u>Fresno County</u>		
I-5 Rest Area (milepost 73)	Not crossed; 0.2 miles from ROW; general construction impacts**	NS
Proposed Coalinga Air Cargo Port (milepost 80)	Not crossed; pipeline aligned around port; possible impediment to potential expansion of cargo port	***
Fresno County Designated Bike Trails	General construction impacts**	NS

*Justification for conclusions (not significant = NS, significant = S) are contained in Appendix C.
**General construction impacts are dust, noise, and traffic congestion.
***Significance of future land use conflicts must be resolved through the local land use planning process.

Table 4-15 (Cont.)

Feature/Location	Comments	Impact Significance*
Fresno County (Cont.)		
SJV-2b Booster Station (milepost 133)	3 acres permanently removed from agricultural use	NS
Little Panoche Reservoir (milepost 136)	Not crossed; 0.9 miles from ROW; general construction impacts**	NS
Microwave Towers No. 6 and No. 7 (mileposts 94 and 112, respectively)	Permanent removal of less than 1 acre from agricultural use	NS
Bureau of Reclamation Lands; Pleasant Valley Levee (milepost 84.6)	Traverses approximately 330 feet; water resources (aqueducts); cultural resources	NS
Merced County		
Bureau of Reclamation Land (milepost 152)	Water resources (aqueducts); cultural resources	NS
Los Banos Creek Reservoir Recreation Area (milepost 153)	Crossed; general construction impacts**	NS
San Luis Reservoir State Recreation Area (mileposts 161-165)	Crossed; general construction impacts**	NS
Bureau of Reclamation Lands (mileposts 158-180)	Water resources (aqueducts); cultural resources	NS
Delta Forebay Golf Club (milepost 163)	Not crossed; 0.9 miles from ROW: general construction impacts**	NS
Proposed United Technologies Plant (mileposts 166-172)	Mitigated by minor realignment	***
Stanislaus County		
I-5 Rest Area (milepost 199)	Not crossed; adjacent to ROW; general construction impacts**	NS

*Justification for conclusions (not significant = NS, significant = S) are contained in Appendix C.
**General construction impacts are dust, noise, and traffic congestion.
***Significance of future land use conflicts must be resolved through the local land use planning process.

Table 4-15 (Cont.)

Feature/Location	Comments	Impact Significance*
San Joaquin County		
Hetch-Hetchy Aqueduct Crossing (milepost 206)	Crosses under; potential contamination of water supply; no effect on aqueduct if constructed minimum of 1 foot below aqueduct	NS
Tracy Golf and Country Club (milepost 206)	Not crossed; 0.2 miles from ROW: general construction impacts**	NS
Carnegie State Vehicle Recreation Area (milepost 211)	Not crossed; located several miles west of ROW; general construction impacts**	NS
Alameda County		
Bethany Reservoir State Recreation Area (milepost 220)	Crosses western edge; removal of approximately 2 acres of recreational area along ROW; general construction impacts**	***
Contra Costa County		
Proposed East Contra Costa County Airport (milepost 226)	Could limit future expansion of airport	NS
Black Diamond Mines Regional Preserve (milepost 240)	Crossed; encroachment on park; possible reduction in use of park; general construction impacts**	***
Contra Loma Regional Park (milepost 240)	Not crossed; 0.1 mile from ROW; general construction impacts**	NS
Proposed Kirker Pass and Central Landfills (adjacent to mileposts 238-245)	Could hinder long-range landfill expansion	NS
Stoneman Park and Proposed Reservoir	Could hinder reservoir construction plans; general construction impacts**	***
Concord Naval Weapons Station (milepost 253)	Crosses approximately 3,000 feet general construction impacts**	NS
Proposed Residential Development Locations (mileposts 244-245; 249; 254; and 257)	Future development impact	***
Proposed Highway Improvements at Highway 4 (milepost 251) and I-680 (milepost 257)	Could interfere with engineering plans for road lowering and widening	***

*Justification for conclusions (not significant = NS, significant = S) are contained in Appendix C.
**General construction impacts are dust, noise, and traffic congestion.
***Significance of future land use conflicts must be resolved through the local land use planning process.

Source: Ecology and Environment, Inc. 1986.

Table 4-16

LAND USES TRAVERSED BY THE PROPOSED ROUTE

County	Agricultural Land		Rangeland		Industrial/ Commercial		Shrubland/ Woodland	
	Miles	%	Miles	%	Miles	%	Miles	%
Kern								
Parallel to Existing ROW	3	7	7	16	6	14	0	0
Not Parallel to Existing ROW	16	36	9	20	3	7	0	0
County Total	19	43	16	36	9	21	0	0
Kings								
Parallel to Existing ROW	9	34	17	64	1	2	0	0
Not Parallel to Existing ROW	0	0	0	0	0	0	0	0
County Total	9	34	17	64	1	2	0	0
Fresno								
Parallel to Existing ROW	18	27	47	73	0	0	0	0
Not Parallel to Existing ROW	0	0	0	0	0	0	0	0
County Total	18	27	47	73	0	0	0	0
Merced								
Parallel to Existing ROW	8	22	27	78	0	0	0	0
Not Parallel to Existing ROW	0	0	0	0	0	0	0	0
County Total	8	22	27	78	0	0	0	0
Stanislaus								
Parallel to Existing ROW	2	7	28	93	0	0	0	0
Not Parallel to Existing ROW	0	0	0	0	0	0	0	0
County Total	2	7	28	93	0	0	0	0
San Joaquin								
Parallel to Existing ROW	0	0	15	100	0	0	0	0
Not Parallel to Existing ROW	0	0	0	0	0	0	0	0
County Total	0	0	15	100	0	0	0	0

Table 4-16 (Cont.)

County	Agricultural Land		Rangeland		Industrial/ Commercial		Shrubland/ Woodland	
	Miles	%	Miles	%	Miles	%	Miles	%
<u>Alameda</u>								
Parallel to Existing ROW	0	0	5	100	0	0	0	0
Not Parallel to Existing ROW	0	0	0	0	0	0	0	0
County Total	0	0	5	100	0	0	0	0
<u>Contra Costa</u>								
Parallel to Existing ROW	1	3	21	57	3	8	10	27
Not Parallel to Existing ROW	0	0	2	5	0	0	0	0
County Total	1	3	23	62	3	8	10	27
Total Parallel	41	16%	167	65%	10	4%	10	4%
Total Not Parallel	16	6%	11	4%	3	1%	0	0

Source: Woodward-Clyde Consultants 1985.

and Contra Costa counties. The major portion of the route in this land use category is oil fields in Kern County and contains other pipeline rights-of-way. In Kings County, the pipeline traverses less than 1 mile of industrial/commercial lands.

The project requires five staging or storage areas of about 20 acres each. Two will be sited at existing facilities, while the other three will be located in Fresno County, Merced County, and Alameda or Contra Costa County. The sites are flat pastures or fallow agricultural land which will be fully restored after construction. The impact is insignificant.

Total land requirements for the project, which were listed in Table 2-6, are categorized by land use in Table 4-17. The impacts on land use from the development of the two new booster/injection stations and the 13 new microwave towers result from removing these sites from their present agricultural and rangeland uses. However, such land use changes would be limited to the areas required for such stations and ancillary facilities (e.g., for water lines, access roads, power lines). The overall land requirements and land use modifications involve 97 acres during construction and only 48 acres for operation. The impact is not significant because the sites are not located on prime agricultural land.

The land use associated with the construction of the proposed project is generally consistent with planning objectives in the eight-county project area (and compatible with the largely rural land uses encountered). To minimize the impacts on land use, 228 miles (88%) of the proposed pipeline are aligned parallel and adjacent to existing rights-of-way (see Table 4-16). Moreover, 57 miles (22%) of the proposed route cross cropland and 178 miles (69%) cross rangelands which will be returned to their original condition and land use.

Based on the inventory of sensitive land uses in Table 3-25, there are some potentially significant land use conflicts between the proposed action and other proposed projects. These potential conflicts are identified by county, and are addressed below.

In regard to the many other land use features identified in Table 4-15, the impact is insignificant based on the present alignment, which will either bypass these features or cause only short-term construction impacts in terms of dust and noise. Future development plans, such as the Town of Kettleman City in Kings County and the proposed Contra Costa Airport, will have to be reconsidered to some extent because of the pipeline, but there is no indication that the project cannot be accommodated. The proposed project has been rerouted to minimize conflicts with the United Technologies Plant in Merced County.

In Contra Costa County, the pipeline traverses the northern part of the Concord Naval Weapons Station for 0.8 miles. The pipeline does not conflict with present activities at the station, and it does not traverse the Tule elk reservation section of the Weapons Station. No heavy machinery, artillery, or buried ordinance are located near the

Table 4-17

LAND REQUIREMENTS BY LAND USE CATEGORIES FOR THE PROPOSED PROJECT

Facility	Construction (acres)					Operation (acres)				
	Agriculture	Rangeland	Wood and Shrubland	Indus-trial	Total	Agriculture	Rangeland	Wood and Shrubland	Indus-trial	Total
Pipeline										
Right-of-Way	553	1,737	97	116	2,503	207	652	36	44	939
Staging Areas	30	30	--	--	60	--	--	--	--	--
SJV-2b Site	6	--	--	--	6	3	--	--	--	3
Rights-of-Way	38	--	--	--	38	19	--	--	--	19
SJV-3b Site	--	6	--	--	6	--	3	--	--	3
Rights-of-Way	8	19	--	--	27	4	9	--	--	13
Microwave Towers										
#1, 1A, 2, 3, 4, 5	--	--	--	0.4	0.4	--	--	--	0.2	0.2
#6, 7, 8, 9, 10, 12, 13	0.1	0.5	--	0.1	0.7	0.1	0.25	--	0.1	0.4
Rights-of-Way	1.7	17.3	--	--	19	1.1	8.6	--	--	9.7
TOTAL	637	1,810	97	116	2,660	234	673	36	44	987

route. Final location of the right-of-way needs to be determined in relation to easement and license to construct (Pieper 1986). No land use conflicts have been identified in regard to the specific land areas in the domain of the BLM or Bureau of Reclamation. The total extent of the project on public lands is less than 9 miles, or less than 4% (see Table 2-3).

Potential impacts on recreational facilities in the eight-county area resulting from the construction of the proposed pipeline will be of short duration and will be caused by noise, dust, and traffic congestion that will increase during the construction period of 2 to 8 months for any one segment. Minor, short-term disruptions, such as noise and dust, may affect the use of nearby parks, recreational facilities in the communities surrounding the proposed pipeline corridor, and I-5 rest areas. With few exceptions, encroachment on these facilities is not anticipated. The exceptions are the Westley Park (I-5) Rest Stop in Stanislaus County, Bethany Reservoir State Recreation Area in Alameda County, and Black Diamond Mines Regional Preserve and Stoneman Park and proposed reservoir in Contra Costa County.

The Westley Park Rest Stop is a much-visited rest area along I-5. Construction of the SJV-3b booster station will not affect the facility's use; therefore, impacts are insignificant.

The proposed pipeline crosses the western edge of the Bethany Reservoir State Recreation Area. Pipeline contruction will require approximately 2 acres of land now used exclusively for recreation, which is a significant impact.

The proposed route traverses the Black Diamond Mines Regional Preserve for less than 0.5 miles (about 2,000 feet). This preserve is a 3,400-acre park with a well-developed system of hiking trails. Recreational use of the park could be significantly impacted, since the 80-foot right-of-way will remove approximately 3.6 acres of preserve land during construction and the maintenance right-of-way will occupy about 1.4 acres.

Stoneman Park is owned by the Department of the Interior but is managed by the City of Pittsburg. The pipeline traverses the park for 1,740 feet and a proposed reservoir within the park for 1,200 feet. The project will remove this land from recreational use and, therefore, is inconsistent with existing land use plans, primarily in regard to the proposed reservoir if reservoir construction would involve earth movements that could disrupt the pipeline. This represents a significant impact on the land use plans for the park.

The proposed pipeline also crosses a number of waterways. These crossings are proposed to be underground, except in two locations, and will result in only minor land use and recreational impacts during construction. Fishing will be temporarily affected in the immediate area of construction until the crossing is complete. The disturbed stream banks will be restored to their original and stable condition after construction has been completed.

Impacts on recreational demand are not expected to be significant because of the comparatively short construction period and the size of each construction spread. As noted in Section 4.2.7, a maximum of 400 non-local workers will be involved in the project. These workers will be distributed in two primary spreads and two mini-spreads along the proposed route as well as the sites of ancillary facilities construction. Based on visitor information, it is not anticipated that recreational use by a work force of this relatively small size will increase the total demand at any facility by more than 10%, nor will it result in significant overcrowding.

During construction of the pipeline, an estimated 100 to 200 pounds of solid wastes, such as scrap timber skids, scrap coating materials, shipping crates, cardboard boxes and paper wrappings, steel bands, tires, buffing wheels, welding rod stubs, paint brushes, and buckets, will be generated per mile of pipeline and will require disposal (Woodward-Clyde Consultants 1986). One ton of solid waste produced from this type of construction will occupy approximately 1 cubic yard of landfill capacity. Table 4-18 shows the impacts of solid waste on existing landfill capacity in counties along the proposed route. The table demonstrates that solid wastes from construction will occupy only a minor portion (less than 0.0000027%) of the available capacity. The impact is insignificant on the landfill capacity of the region as well as individual counties.

Operation

Once the pipeline is built, operation of the proposed project will be consistent with land use plans and objectives in the affected eight-county area. Land use impacts during the operation of the pipeline include the long-term maintenance of a 30-foot right-of-way, removal of existing land use for the life of the project, and the potential for pipeline rupture. The long-term maintenance of a right-of-way prohibits certain land uses such as woodlands and structures and may impede future urban growth and other developments. It will not prevent recreational uses such as hiking, picnicking, or fishing, and will thus have no significant impact on recreation areas.

Certain potential land use conflicts identified for the construction phase will remain over the life of the project and will preempt certain other development proposals, primarily in Contra Costa County (see Table 4-15). In this area, a variety of development proposals are pending, including residential projects, landfills, a new reservoir, and highway improvements. The proposed action, which would constitute an exclusive right-of-way for about 2 miles in Contra Costa County, could prevent these planned developments from proceeding as planned. The significance of these conflicts will be determined through the local land use planning process.

Operation of the project only requires a small work force of a dozen people; therefore, recreational use will not increase the permanent demand at any facility by more than 10% and will not result in

Table 4-18

IMPACTS OF SOLID WASTE DISPOSAL
ON LANDFILL CAPACITY

County	Estimated Amount of Solid Waste Produced from Pipeline Construction* (tons)	Landfill Capacity (cubic yards)	Waste as a % of Available Landfill Capacity*
Kern	4	2,932,000	1.3×10^{-6}
Kings	3	(?)	(?)
Fresno	7	1,000,000	7×10^{-6}
Merced	4	390,000	10.2×10^{-6}
Stanislaus	3	500,000	6×10^{-6}
San Joaquin	2	650,000	3×10^{-6}
Alameda	1	4,900,000	2×10^{-6}
Contra Costa	4	(?)	(?)
TOTAL	28	10,340,000	

* Estimated solid waste produced is 200 pounds per mile of pipeline construction (Woodward-Clyde 1985). It is assumed that one ton of solid waste occupies one cubic yard of landfill capacity.

**In Contra Costa County, the Contra Costa Landfill will be full sometime between 1992-1994 and Acme fill will close between 1987 and 1989 (Environmental Impact Planning Corporation 1986).

overcrowding. The impacts of the pipeline right-of-way on previously inaccessible environmentally sensitive areas will be minimal. Since most of the areas traversed in the eight-county area are already accessible to off-road vehicles, and the pipeline predominantly follows existing rights-of-way, the operation of the pipeline right-of-way is not expected to open up sensitive areas for human use.

Operation of the pipeline will not significantly impact solid waste disposal capacity because operation will produce only limited wastes.

Accidents

The impact of an oil spill from a pipeline rupture would depend on the amount and type of product spilled, the environmental setting (e.g., topography, geological conditions, weather, etc.), and the location of the spill (e.g., near sensitive environmental uses). Sensitive land uses such as parks, waterways, reservoirs, and residential areas would be significantly affected in the event of an oil spill. Usage of such facilities would be interrupted until cleanup measures were completed.

An oil spill would have a minor effect on solid waste disposal capacity. Oil mixed with soil would have to be excavated and disposed of in a landfill. In California, heavy crude oil must be disposed of in a hazardous waste type landfill (Class I). Only one disposal area has been identified along the proposed route as a Class I site: the Hanford landfill in Kings County, which is scheduled to close in 1993. However, a variance can be obtained to dispose of the oil-contaminated soil in Class II landfills if approved by the California Department of Health and Safety and the Water Quality Control Board.

Abandonment

At the end of the economic life of the project (30 to 40 years), the pipeline will be abandoned. The oil will be removed from the pipeline and replaced with water. Impacts of abandonment will be similar to those discussed for pipeline operation. All above-ground facilities and foundations will be dismantled and removed. Impacts resulting from this procedure will be similar to those described for construction. Equipment will be salvaged and recycled. Refuse and some debris, however, will require disposal at authorized disposal sites.

4.2.10 Visual Resources

The assessment of visual impact was based on an adaptation of BLM's Visual Resource Management (VRM) system. This involved an analysis of the degree of visual contrast of each project feature, which was determined based on whether the specific feature would likely stand out in its landscape by virtue of its form, line, color, or texture, as well as its degree of visibility (see Appendix E). The impact assessment also considers permissible cultural modifications, permissible contrasts with project features, and the present degree of cultural modification; i.e., prior to project implementation. A rating based on the combination of these considerations was used as the basis for the visual impact assessment.

Two visual simulations of the project area are included in this analysis. These are generic simulations; that is, simulations of typical project features rather than exact depictions of specific designs of project features. The simulations were of: (1) a typical pipeline right-of-way in a sensitive VRM Class 1 area (in this case, near Black Diamond Mines and Contra Loma Regional Park in Contra Costa County), and (2) a typical pump station as it will appear from an area that will be seen by large numbers of people (SJV-3b near the Westley Rest Stop, along I-5 at the Stanislaus-San Joaquin county line).

No specific standards exist to determine what constitutes significance of visual impact along any portion of the pipeline route or at the ancillary facilities locations. Given the considerations and assumptions discussed in Appendix E, the criteria identified for this study provide a relative indication of the significance of the alteration created by a project feature. A significant impact will result if:

- The project feature creates a visible strong contrast with the existing visual landscape;

- The landscape alteration conflicts with special policies or objectives for scenic protection because of the project feature's visual contrast; and/or

- The visual contrast of project features dominates other features which already have modified the visual landscape, or will add significantly to the cumulative alteration of a visual landscape in a given area.

These impact criteria are incorporated into Table 4-19, which indicates the general level of significance for various contrast ratings in relation to VRM classes.

The implementation of mitigation measures will substantially reduce short-term significant impacts to long-term insignificant impacts. This is evident where existing pipeline rights-of-way have become fully revegetated and are now fully integrated visually into the surrounding landscape.

Impacts of the ancillary facilities will be long-term and mostly unavoidable. While some mitigation is possible to reduce some of the visual contrast, the facilities cannot be hidden from viewers.

Table 4-19

MATRIX OF GENERAL VISUAL IMPACT SIGNIFICANCE

	Visual Contrast Rating		
VRM Class	High	Moderate	Low
1	Significant	Significant	Insignificant
2	Moderately significant	Insignificant	Insignificant
3	Insignificant	Insignificant	Insignificant

Construction

Areas of potentially significant visual impact are identified by milepost in Table 4-20. The significant and insignificant impacts which are indicated would occur during the short-term construction period. The impacts are mitigated by right-of-way restoration and revegetation.

The pipeline right-of-way mostly traverses rangelands, and the potential for significant impact exists for the short-term period during and shortly after construction. Pipeline construction involves considerable disruption of the vegetation cover and soil over an 80-foot-wide strip along the entire length of the right-of-way. The exposure of the bare soil, including temporary stockpiling of soil and equipment storage, creates a strong contrast with the existing visual landscape along most of the route. Less visual contrast occurs where soil disturbance already exists because of agricultural activities, existing roads and powerline corridors, oil fields, and other activities.

The construction of the pipeline will have the most visual contrast during and shortly after construction when soil and vegetation disturbances are greatest. Figure 4-3 shows the right-of-way as it would look shortly after the trench has been backfilled and before revegetation has occurred; compare this with Figure 4-2. (These visual resource figures are located at the end of this subsection.)

Segments 1, 2, and 3 of the right-of-way encompass most of the areas of insignificant impact. Areas of potentially significant visual impacts during construction are located only in Segment 4 of the proposed pipeline route:

Mileposts 104 - 116: approximately 12 miles in length; Fresno County, in foreground and middleground of I-5.

Mileposts 158.5 - 163: approximately 4.5 miles in length; Merced County, in foreground of I-5, Highways 152 and 207.

Mileposts 168.5 - 174: approximately 5.5 miles in length; Merced and Stanislaus counties, middleground of I-5.

Mileposts 192 - 220: approximately 28 miles in length; Stanislaus and San Joaquin counties, foreground of I-5, near Westley Rest Stop.

Mileposts 224.5 - 227.5: approximately 3 miles in length, Alameda and Contra Costa counties, foreground and middleground of Camino Diablo Road.

Mileposts 227.5 - 235: approximately 7.5 miles in length; in Contra Costa County, foreground and middleground of Walnut Boulevard and Camino Diablo Road.

Table 4-20

MATRIX OF VISUAL IMPACTS OF THE PROPOSED PIPELINE

Segment	Milepost	VRM Class	Visual Contrast	Comments	Impact
1	0 - 2	3	Low	--	Insignificant
1	2 - 4	2	Low	--	Insignificant
1	4 - 8	2	Low	In PL ROW	Insignificant
1	8 - 12	3	Low	In PL ROW	Insignificant
1	12 - 18.5	3	Low	In Rd ROW	Insignificant
2	18.5 - 35	3	Low	In Rd ROW	Insignificant
2	35 - 40	3	Low	--	Insignificant
3	40 - 61	3	Low	In Rd ROW	Insignificant
3	61 - 63	3	Low	In PL ROW	Insignificant
3	63 - 71.3	3	Low	--	Insignificant
3	71.3 - 80	1	Low	--	Insignificant
3	80 - 84	2	Low	--	Insignificant
4	84 - 87.5	3	Low	--	Insignificant
4	87.5 - 88.5	1	Low	Near Rd ROW	Insignificant
4	88.5 - 90	3	Low	Near Rd ROW	Insignificant
4	90 - 104	2	Low	In TL & PL ROW	Insignificant
4	104 - 116	1	Moderate	In PL ROW	Significant
4	116 - 135	2	Low	In TL & PL ROW	Insignificant
4	135 - 148	3	Low	In TL & PL ROW	Insignificant
4	148 - 152	3	Moderate	--	Insignificant
4	152 - 158.5	2	Moderate	In PL ROW	Insignificant
4	158.5 - 163	1	Moderate	In Rd ROW	Significant
4	163 - 168.5	3	Low	Near TL & PL ROW	Insignificant
4	168.5 - 174	1	High	--	Significant
4	174 - 179.5	3	Low	Near & in TL ROW	Insignificant
4	179.5 - 181	2	Low	Near TL ROW	Insignificant
4	181 - 192	3	Low	Near TL	Insignificant
4	192 - 203	1	High	Near Rd ROW	Significant
4	203 - 220	1	High	Near Rd & PL ROW	Significant
4	220 - 224.5	2	Low	In PL & TL ROW	Insignificant
4	224.5 - 227.5	2	High	--	Significant
4	227.5 - 235	1	Moderate	In PL ROW	Significant
4	235 - 244	1	High	--	Significant
4	244 - 245.5	2	Low	In TL ROW	Insignificant
4	245.5 - 246.5	1	High	--	Significant
4	246.5 - 247	2	Low	TL ROW	Insignificant
4	247 - 252	1	Moderate	In TL ROW	Significant
4	252 - 254	1	High	--	Significant
4	254 - 256	2	Low	Near TL ROW	Insignificant
4	256 - 258	3	Low	Near TL ROW	Insignificant
4	258 - 259	2	Low	Near TL & Rd ROW	Insignificant

Key:

PL ROW = existing pipeline right-of-way
L ROW = existing power transmission line right-of-way

Mileposts 235 - 244: approximately 9 miles in length; Contra Costa County, foreground and middleground of Black Diamond Mines Regional Preserve and Contra Loma Regional Park and background of Antioch.

Mileposts 245.5 - 246.5: approximately 1 mile in length; Contra Costa County, foreground and middleground of Kirker Pass Road.

Mileposts 247 - 252: approximately 5 miles in length; Contra Costa County, middleground and background of Highway 4.

Mileposts 252 - 254: approximately 2 miles in length; Contra Costa County, middleground and background of Highway 4, Concord and Martinez.

The implementation of mitigation measures to the construction right-of-way substantially reduces the period of short-term significant impact; the long-term impact is insignificant. This is evident where existing pipeline rights-of-way are well-revegetated and fully integrated visually into the surrounding landscape. It has been noted in the soil impact section (Section 4.2.4) that some segments of the pipeline have a poor revegetation potential because of slope, soil erodibility factors, and climatic extremes. Where revegetation fails, the potential for long-term visual impact is great. Table 4-21 indicates which right-of-way portions have a significant impact during construction and potentially thereafter because of significant constraints on revegetation. Most of the area subject to revegetation problems will only undergo a short-term significant impact.

The construction of new towers, new booster stations, access roads, and power lines will result in visual contrasts. These ancillary facilities will have long-term impacts on the visual landscape. The impact depends on the type of feature and the nature of the surrounding visual landscape, as described below (see Table 4-22).

Microwave station No. 1 will be located at Weir substation, in an oil well field. It will be located on an existing 100-foot-tall tower, and will be visible only at a fairly great distance from the nearby communities of Fellows and Derby Acres. Given the extensive visual alterations already existing in this oil field, the microwave station will not impact the visual landscape.

Microwave tower No. 1A and the McKittrick injection station will be located in McKittrick Valley, which contains numerous visual landscape alterations, such as power transmission lines, oil tanks, oil wells, and roads. The injection station will not significantly alter the landscape or be highly visible from McKittrick, located several miles to the southeast. The microwave station will be 100 feet tall, but will not have a visual impact.

Microwave station No. 2 will be located at the Kernridge injection station in the South Belridge oil field, which contains numerous visual landscape alterations such as power transmission

Table 4-21

LONG-TERM VISUAL IMPACT ASSESSMENT BASED ON PROBABLE CONTRAST OF RIGHT-OF-WAY DUE TO POTENTIALLY POOR REVEGETATION BY COUNTY

	Mileposts		
County	Significant Visual Impacts During Construction (1)	Potential Slope-Related Revegetation Failure (2)	Significant Long-Term Visual Impacts
Kern	N.A. (3)	5-7 11-21	N.C. (4)
Kings	N.A.	62-72	N.C.
Fresno	104-116	91-96.5 106-112 134.5-138.5	N.C. Significant (106-112) N.C.
Merced	158-163 167-174	138.5-146 150-158 168.5-174	N.C. N.C. Significant (168-174)
Stanislaus	192-201	175-179 184-198	N.C. Significant (192-198)
San Joaquin	201-218	205-206 216-217.5	Significant (205-206) Significant (216-218)
Alameda	218-220	217.5-224	Significant (218-220)
Contra Costa	224-244 245-246 252-254	224-226 238.5-254	Significant (224-226) Significant (245-246) Significant (252-254)

(1) See Table 4-17.

(2) Soil impact (see Table 4-2 in Section 4.2.4).

(3) Not Applicable: No significant visual impacts during construction.

(4) No Correspondence: Segments having a low revegetation potential do not correspond to segements having a high visual impact during construction.

Table 4-22

MATRIX OF VISUAL IMPACT OF ANCILLARY FACILITIES

Facility	VRM Class	Visual Contrast	Comments	Impact
Microwave No. 1	3	None	Existing 100-foot tower	None
Microwave No. 1A and	3	None	100-foot tower	None
McKittrick Station	3	Low	--	Insignificant
Microwave No. 2 and	3	None	Existing 205-foot tower	Insignificant
Kernridge Station	3	Low	--	Insignificant
California Aqueduct Crossing	3	None	Underground	Insignificant
Mid Station and	3	Moderate	Near pumping station	Insignificant
Microwave No. 3	3	None	205-foot tower	None
California Aqueduct Crossing	3	Low	Underground	Insignificant
Kettleman Station	3	Low	Near tanks	Insignificant
and Microwave No. 4	3	Low	255-foot tower	Insignificant
Caliola Station	2	Low	Near tanks	Insignificant
and Microwave No. 5	2	Low	180-foot tower	Insignificant
Microwave No. 6	2	None	180-foot tower	None
Access road and power line	2	High		Significant
Microwave No. 7	2	Low	205-foot tower	Insignificant
SJV-2b Booster Station	2	High	Near TL ROW	Significant
and Microwave No. 8	--	High	--	Significant
Microwave No. 9	3	High	--	Insignificant
California Aqueduct Crossing	2	Low	Existing structure	Insignificant
Delta Mendota Canal Crossing	2	Low	Existing structure	Insignificant
California Aqueduct Crossing	-	None	--	None
Microwave No. 10	1	High	Near TL ROW	Significant
SJV-3b Booster Station	1	High	Near TL ROW	Significant
and Microwave No. 11		High	Near TL ROW	Significant
Microwave No. 12	2	High	Steep hills (Mount Oso)	Insignificant
Microwave No. 13	1	Moderate	Near other	Significant
Microwave No. 14	2	Moderate	Industrial	Insignificant

Key:

FG = view in foreground
MG = view in middleground
BG = view in background
SS = seldom seen

* Designated scenic route

lines, oil tanks, oil wells, and roads. The microwave will be on an existing 205-foot tower. It will be visible to nearby residences located in the oil field, but constitutes a minor alteration of the landscape and the impact is insignificant.

The crossing of the California Aqueduct at mileposts 32 and 61 will be underground. The impact is insignificant.

Microwave station No. 3 will be located at Mid station adjacent to I-5 in Kern County. The landscape in this area is flat agricultural fields with a large transmission line located directly behind the tower and station site, as viewed from I-5. The microwave will be a 205-foot tower. No residences are located within close viewing distance of the station and tower; it does not impact the landscape.

Microwave station No. 4 will be located at the Kettleman station adjacent to I-5 in Kings County. I-5 is not a designated scenic route in this area. The landscape in this area is flat agricultural fields with a large transmission line located east of the freeway and hills, with grasslands west of I-5. The microwave will be 255 feet high. It will be visible from residences in Kettleman City, located within close viewing distance of the tower (about a half-mile), and to numerous travelers on I-5. The microwave facility is an insignificant alteration of the landscape, as is the adjacent injection station.

Microwave station No. 5 will be located at the Caliola station about 1 mile west of I-5 in Fresno County. I-5 is a designated scenic route in this area. The landscape in this area is flat to gently sloping agricultural fields, with a large transmission line located east of the freeway. The injection station is located adjacent to an existing tank farm. The microwave tower will be 180 feet high. It will be visible from I-5. No residences are located within close viewing distance of the tower. These facilities represent an insignificant alteration of the visual landscape.

Microwave station No. 6 will be built on an 180-foot tower west of I-5 in Fresno County. I-5 is a designated scenic route in this area. The landscape in this area is hilly grasslands, with a large transmission line located west of the freeway. Because of its height and location on a hill, the microwave will be visible from I-5. No residences are located within close viewing distance of the tower. The microwave facility will have an insignificant visual impact. The construction of an electric transmission line and access road will create a high visual contrast in the grasslands within the middleground viewing distance of I-5. Because this is located in a VRM Class 2 area, the impact is significant.

Microwave station No. 7 will be built on a 205-foot tower about 3/4-mile east of I-5 in Fresno County. I-5 is a designated scenic route in this area. The landscape is flat agricultural land east of I-5 and hilly grasslands to the west. Large transmission lines are located both east and west of the freeway. No residences are located close to the tower. The tower is located behind a major transmission line, as viewed from the freeway. It will be visible at a distance from I-5 and, because of its isolated location in the fields, will have an insignificant impact on the landscape. The access road and power transmission line to the site do not add a strong visual contrast to the fields and existing power transmission line; therefore, the impact will be insignificant.

SJV-2b booster station and microwave station No. 8 will be located just west of I-5 in Fresno County. I-5 is a designated scenic route in this area; the area is in VRM Class 2. The landscape is flat agricultural fields, with a large transmission line located west of the freeway and hills, and grasslands further west forming the background view of I-5. The booster station will be located in an agricultural area near power transmission lines. The water line and gas line to the site will have low visual contrast and visibility, and the impact is insignificant. The electric power transmission line will have high visual contrast and will add to the cumulative visual alteration created by existing power lines in the area. Because of its high visibility in a VRM Class 2 area, the power line will have a significant impact.

Microwave station No. 9 and its proposed power transmission line will be located in Merced County at Laguna Seca Ranch. This is an area of hills and grasslands. The tower will be located at the summit of a hill about 3 miles west of I-5. I-5 is a designated scenic route in this area. The tower will be in the visual background of I-5. The 130-foot tower will be visible from the freeway, but will form a minor element of the visual landscape. The nearest residence is the Laguna Seca Ranch, about 2 miles away. The tower, its access road, and power transmission line will have high visual contrast in the landscape, but will be insignificant because of its distance from the nearest residence and I-5.

The pipeline crossings of the California Aqueduct and Delta Mendota Canal pipeline at mileposts 160 and 163 will be located on existing structures that carry pipelines over the aqueducts. The visual impact of adding another pipeline at each of these crossings is minor, and the overall impact will be insignificant. The California Aqueduct crossing at milepost 166 will be underground and without a long-term visual impact.

Microwave station No. 10 will be a new 105-foot tower located on a grassy hill about 1 mile west of I-5. I-5 is a designated scenic route in this area. The tower and power line will have a high contrast with the surrounding landscape. Although a major transmission line corridor is located to the west of the site, it is seen only intermittently from I-5. A residence is located about 2 miles south of the tower site. The impact will be significant.

SJV-3b booster station and microwave station No. 11 are located about 1/4-mile west of I-5 in Stanislaus County. I-5 is a designated scenic route in this area. The site is an open grassland with a relatively natural appearance. The Westley Rest Stop is located about 1/4-mile north of the site. The site has a high level of visibility to traffic in both the northbound and southbound directions. The microwave tower will be 50 feet tall, which is not higher than the nearby power transmission lines. However, the microwave tower and access road will be located closer to the freeway than the transmission lines and have higher visibility (a sensitive visual management area), hence the impact will be significant (see Figures 4-4 and 4-5).

Microwave station No. 12 will be a 50-foot tower located on the summit of Mount Oso. This prominent peak is visible from I-5, a designated scenic route in this area. The peak appears in the background of views from I-5 and the adjoining agricultural areas of the valley to the east. The tower will be visible from the portion of I-5 about 6 to 8 miles to the north. At this distance, the tower can be seen, but will appear small. The impact is insignificant.

Microwave station No. 13 will be a 50-foot tower located on the summit of Mount Diablo in Contra Costa County. This is a state park, and a prominent viewpoint visible to a large number of communities in the vicinity. It receives fairly large visitation because of its scenic prominence and natural landscapes. Although numerous towers already exist on the summit, the impact of microwave No. 13 is significant, contributing to the cumulative visual impacts occurring on the scenery of Mount Diablo.

Microwave station No. 14 will be an 80-foot tower located in an industrialized portion of Martinez. The tower will be fairly prominent, but will not contrast greatly with the surrounding industrial structures. The impact is insignificant.

Operation

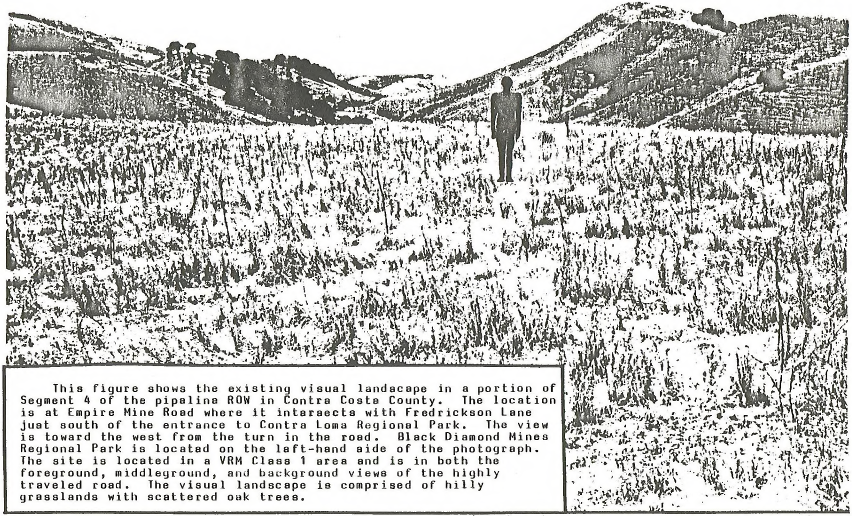
Operation of the project associated facilities will not have an additional impact on visual resources once these facilities have been built, but the impacts of construction last over the life of the project. Maintenance of the right-of-way will ensure that the vegetation cover does not degrade through erosion. Periodic mowing of the grass cover will be visible and contrast right-of-way vegetation with surrounding vegetation, particularly in shrubland, over the life of the project. The impact is insignificant.

Accidents

Visual resources will not be significantly impacted by a spill. Important topographical elements in the landscape are not affected. The loss of trees due to oil toxicity would be significant but the chance of a spill near trees is small because trees are relatively rare or extremely localized in their distribution.

Abandonment

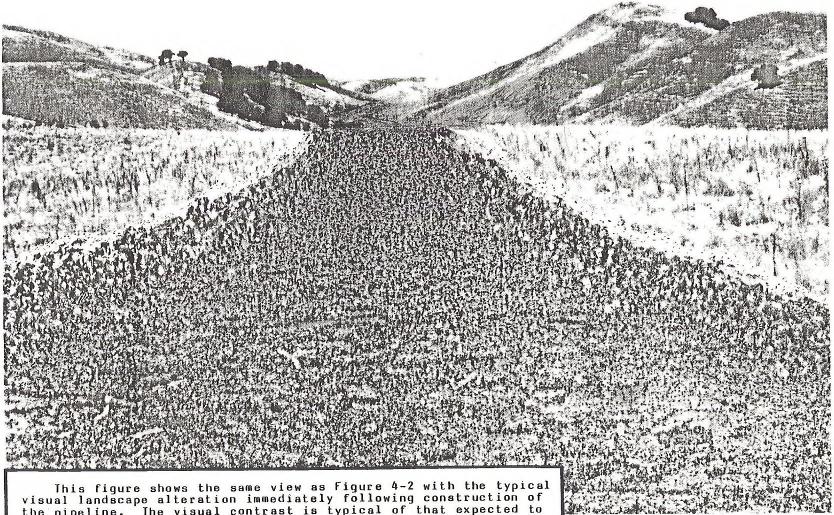
Removal of structures, pavement, equipment, etc., and revegetation of the former facility site will eliminate visual contrasts. It is likely that some features may be retained beyond the design lifetime of the project. For example, some of the towers with project



This figure shows the existing visual landscape in a portion of Segment 4 of the pipalina ROW in Contra Costa County. The location is at Empire Mine Road where it intaraects with Fredrickson Lane juat south of the entrance to Contra Loma Regional Park. The view is toward the west from the turn in the road. Black Diamond Mines Regional Park is located on the laft-hand aide of the photograph. The site is located in a VRM Class 1 area and is in both the foreground, middleground, and background views of the highly traveled road. The visual landscape is comprised of hilly grasslands with scattered oak trees.

Figure 4-2 EXISTING VIEW OF PROPOSED PIPELINE RIGHT-OF-WAY

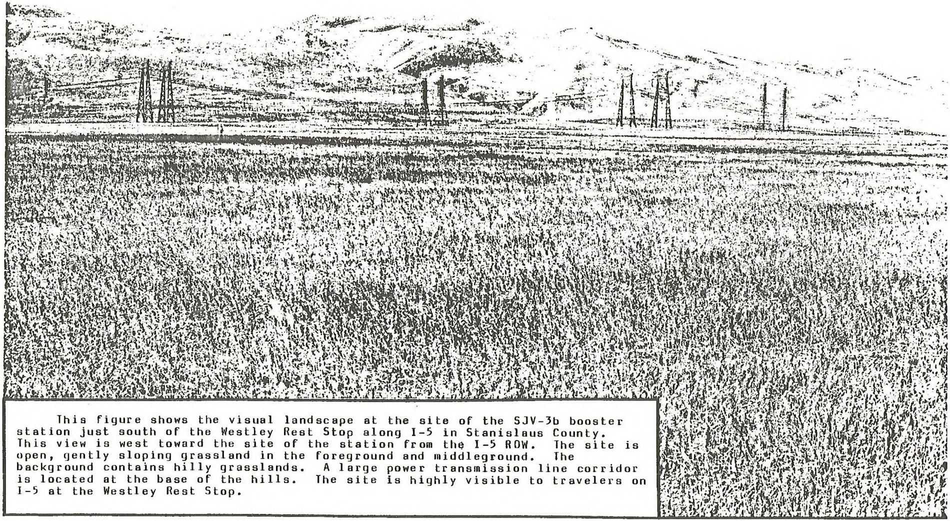
SOURCE: ESA



This figure shows the same view as Figure 4-2 with the typical visual landscape alteration immediately following construction of the pipeline. The visual contrast is typical of that expected to occur in areas of open grasslands. In this case, the visual contrast is rated as high and because of the ROW's location in VRM Class 1, the short-term impact is considered to be significant.

Figure 4-3 SIMULATED VIEW OF PIPELINE RIGHT-OF-WAY IMMEDIATELY FOLLOWING CONSTRUCTION

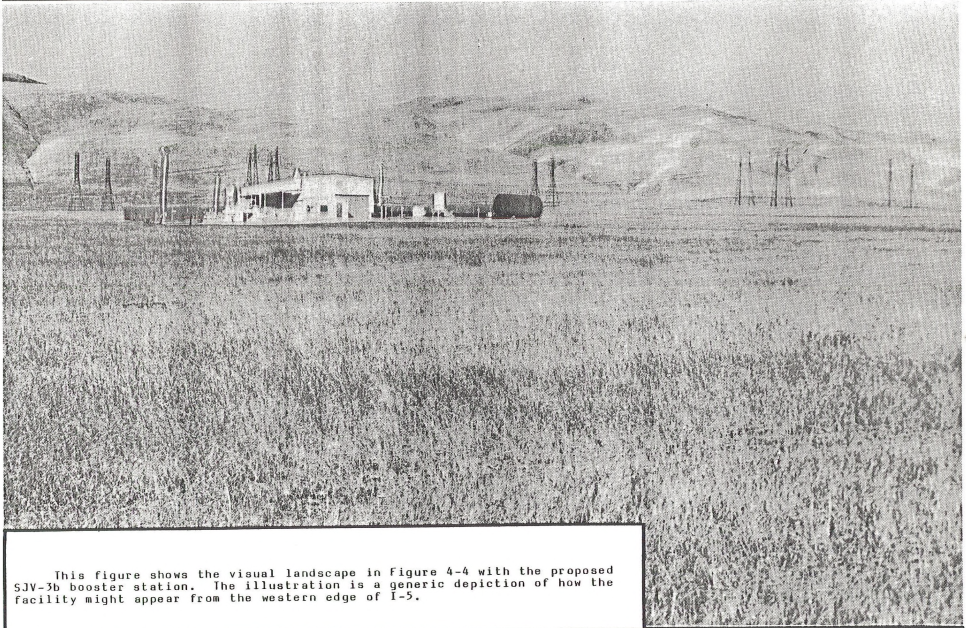
SOURCE: ESA



This figure shows the visual landscape at the site of the SJV-3b booster station just south of the Westley Rest Stop along I-5 in Stanislaus County. This view is west toward the site of the station from the I-5 ROW. The site is open, gently sloping grassland in the foreground and middleground. The background contains hilly grasslands. A large power transmission line corridor is located at the base of the hills. The site is highly visible to travelers on I-5 at the Westley Rest Stop.

Figure 4-4 EXISTING VIEW FROM I-5 NEAR THE WESTLEY REST STOP

SOURCE: ESA



This figure shows the visual landscape in Figure 4-4 with the proposed SJV-3b booster station. The illustration is a generic depiction of how the facility might appear from the western edge of I-5.

Figure 4-5 SIMULATED VIEW OF SJV 3b BOOSTER STATION FROM I-5 NEAR THE WESTLEY REST STOP

SOURCE: ESA

microwaves and canal crossing structures may be retained, and future residents may find it desirable to retain some access roads constructed for the project and some landscaping (particularly trees or shrubs which may have been established). Thus, some visual alterations will continue after abandonment of the project, but will not be significant.

4.2.11 Paleontology

Potential impacts to paleontological resources were assessed based on a thorough review of pertinent literature and critical analysis of the overview report on paleontological and cultural resources along the proposed route prepared by Woodward-Clyde Consultants, and a 19-day field survey of route segments identified in advance as potentially sensitive. Interpretation of the combined data has allowed delineation of areas which have the highest probability of including abundant and/or especially important vertebrate fossils and which are not insulated by deep, young alluvial cover. However, the nature of paleontological resources is such that pre-excavation investigations cannot predict with absolute certainty the locations of all important fossils which may be affected by project construction, especially for areas and formations not previously known to produce such fossils.

For purposes of this assessment, significance of impact is determined by the probability that the proposed project will cause direct loss or damage or disturbance of significant, localized fossil deposits.

Impacts to paleontological resources resulting from the proposed project will depend on such factors as the presence or absence of previously known fossil-producing localities, extent and depth of soil or recent alluvial cover over bedrock, the exact relationships between productive fossil zones and the proposed pipeline system, and significance of local fossils. Both direct and indirect impacts may occur and, in some circumstances, the impacts may be positive, such as in areas where trenching or grading provides the only available access to bedrock now obscured by soil and vegetative cover, and thus provides an opportunity for finding fossils which would not otherwise be identified.

The potential for finding fossils within a given area has been estimated on the basis of the distribution of known nearby localities, local geologic trends, and details of rock characteristics in the area. The reliability and resolution of these estimates depends on the amount of data available for the immediate vicinity. Published literature and museum records provided preliminary data and revealed broad-scale trends. The field survey considerably improved the resolution of these estimates, but surficial cover of large areas still prevented a highly detailed delineation of possible small-scale fossiliferous zones. Because vertebrate fossils are typically rare, even in areas considered to have "high" potential, the absence of known localities cannot be taken as evidence for the absence of fossils. Locality data are therefore supplemented, when possible, with detailed information about specific rock characteristics. These characteristics, and their relationships to the potential for fossils, are summarized in Appendix F. It is not possible to predict specific locations of undiscovered fossil localities, although the distribution of known localities, coupled with geologic trends of specific rock types, has been used to delineate areas of high fossil probability. For this area and this project, this approach is judged to be the best available methodology to accomplish the impact assessment.

A general set of guidelines which have been applied in California in a number of projects and judged acceptable by BLM and COE are summarized in Appendix F, Table F-2. These criteria have been used to identify the paleontological resources with high to very high sensitivity which are presented in Table 4-23.

Potential impacts to paleontological resources resulting from project construction, operation, accidents, and abandonment are discussed below.

Construction

In areas of known and still-productive localities within the right-of-way and on sites designated for ancillary facilities, trenching or grading during pipeline construction may result in direct destruction of most fossils within the excavated portion and may result in the loss of geologic context, which is used to determine the age and significance of the resource. Vehicle traffic may have similar effects on near-surface resources. Construction of buildings, paving, and backfilling may prevent future access and scientific investigation. Indirect impacts of unauthorized collecting of vertebrate fossils could occur or be increased by drawing attention to the presence and location of vertebrate fossils.

The proposed route crosses or comes very close to approximately 10 recorded fossil-producing localities. Nearly 100 vertebrate localities are recorded within 1 mile of the proposed route. Because of extreme variations between recorded localities in terms of numbers and concentrations of specimens and in prospects for future collecting, project impacts on known localities vary from significant to inconsequential. The field survey team attempted to locate the potentially threatened localities to determine probable impacts for each. In most cases, impacts are expected to be insignificant. For the remaining cases, exact locality data is regarded as confidential (for protection of the resources) and details will be provided to those responsible for construction mitigation. Proximity to known localities (even if depleted) was considered in the assessments listed in Table 4-23, as this information bears on the probability of encountering buried fossils in the course of construction.

Fossils may exist in nearly all types of sedimentary rock or unconsolidated alluvial deposits. Because the entire proposed route is aligned within areas where such rocks or deposits occur at and near the surface, paleontological resources could be present, and impacts could occur, at any point along the route. However, very young sedimentary deposits (such as surficial deposits in historically active

Table 4-23

SUMMARY OF PALEONTOLOGICAL IMPACT SIGNIFICANCE ASSESSMENTS FOR PROPOSED PROJECT

Location				Assessment	
Milepost:					
From	To	Total Miles	Geological Unit	Potential	Impact Significance
2.1	3.4	1.3	Tulare	Moderate	High
6.3	6.5	0.2	McKittrick	Very high	Very high
11.0	11.9	0.9	Tulare	Moderate	High
61.3	67.4	6.1	Tulare	High	High
86.6	88.5	1.9	Tulare	High	High
89.6	90.8	1.2	Tulare	High	Very high
90.8	95.8	5.0	San Joaquin	High	Very high
192.5	194.0	1.5	San Pablo	Moderate	High
209.5	210.3	0.8	(unnamed)	High	High
211.0	214.8	3.8	(unnamed)	High	High
216.0	218.2	2.2	Tulare	High	High
218.2	219.8	1.6	San Pablo	Moderate	High
228.8	230.8	2.0	Kreyenhagen	High	High
242.2	242.3	0.1	San Pablo	High	High
242.3	243.0	0.7	San Pablo	Moderate	High
243.0	244.8	1.8	Wolfskill	High	High
245.2	245.4	0.2	San Pablo	Moderate	High
248.5	250.9	2.4	Wolfskill	High	High
253.7	254.2	0.5	Wolfskill	High	High
TOTAL MILES		34.2			

Source: Bruce Hanson.

floodplain areas) are of such limited paleontological interest that impacts to them may be considered inconsequential. In addition, in agricultural areas, deep cultivation probably has destroyed any fossils that may have existed; as a result, any such affected areas are judged to have insignificant impacts.

While excavation may damage or destroy undiscovered fossil deposits, their detection prior to and during construction would make these resources accessible until they are again covered over. The discovery and concomitant salvage of these fossils by professionals would add to the paleontological knowledge base and would represent a beneficial impact of pipeline construction. Any unauthorized collecting of fossils discovered along the proposed route will not only deplete the resource, but remove evidence that it ever existed, thereby resulting in significant negative impacts.

The field survey allowed delineation of several broad-scale zones (on the order of tens of feet thick and 1 or more miles long, in most cases), but because of constraints of time and especially limited bedrock exposure, not all expected small-scale concentrations could be assessed, though a few were detected. The extent of project impacts on these areas is expected to parallel the assessed sensitivity ratings for individual segments as listed in Table 4-23, and the listed segment lengths reflect, in part, the sizes of the identified zones.

Deserving particular consideration is a zone of unusually high vertebrate fossil potential and significance which is crossed by the proposed route near McKittrick. Previous investigations (Jefferson 1986) and the field survey have shown that this late Pleistocene unit includes geographically restricted "subzones" of particularly high fossil content, examples of which occur within 100 feet both east and west of the route. The proposed route crosses a relatively narrow band of this deposit (compared to closely adjacent areas), apparently because previous excavation of roads and well platforms has already removed previously existing portions. The remaining segment, however, occurs at a steep cliff which must be crossed by the pipeline. This will probably require unusually deep excavation to maintain an acceptable gradient for the pipeline, resulting in removal of a disproportionately large volume of the fossiliferous deposit and a significant negative impact. The geographic restriction of this deposit and access limitations imposed on the remaining resources by existing roads, structures, and disturbed areas contribute to the very high sensitivity of remaining accessible portions.

Operation

The inaccessibility of paved-over sites occupied by the project facilities for the future discovery of fossil resources is considered to be a minor adverse construction impact. Operation of the project will not have a significant impact on paleontological resources. Indirect impacts of unauthorized collection of fossils could result in significant impacts over the life of the project and thereafter, if fossil discoveries and localities become widely known.

Accidents

Accidents and oil spills do not have a relationship to paleontological resources, which will not be adversely impacted. Construction will already have impacted surficial fossils if they were not first recovered.

Abandonment

No impacts are expected to occur to paleontological resources when the project is eventually abandoned. New opportunities for discovering fossils would occur after the life of the project at the sites where project facilities are dismantled.

4.2.12 Cultural Resources

Construction of the proposed project has the potential to affect cultural resources through the disturbance or destruction of recorded or unrecorded sites. Operation and abandonment of the proposed project, on the other hand, will not have a direct adverse effect on cultural resources.

The survey for identification of cultural resources on the proposed route identified several isolated artifacts which are not of cultural significance and one new potentially significant prehistoric site (in addition to those previously recorded). A survey report, including evaluations of significance, is under review as described below. The sections that follow describe the significance criteria that will be employed in evaluation and a discussion of impacts.

Cultural resources located along the proposed route will be evaluated in accordance with established federal and state significance criteria. The eligibility criteria of the National Register of Historic Places (NRHP), 36 CFR 60.4 (revised November 1981), are used to evaluate cultural resources on federal lands and private lands that may be impacted by federally funded or licensed projects. These criteria apply to resources (historic and prehistoric sites) that are deemed significant at the national, regional, state, or local levels. Direct or indirect impacts (36 CFR 800.3) that produce adverse effects on cultural resources are considered for sites listed on the NRHP or for sites which meet the eligibility criteria for inclusion on the NRHP.

The California Environmental Quality Act (CEQA) also sets forth criteria for evaluating cultural resources on state and private lands in California (see Appendix K of the California Administrative Code, Title 14, Natural Resources, Division 6, Resources Agency). These criteria are applied to all cultural resources that may be adversely affected by construction or other land use changes.

Federal agencies cannot authorize federally licensed projects without prior compliance with Section 106 of the National Historic Preservation Act. This involves consultation with the State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation to determine the existence and significance of cultural effects.

Prior to authorization of the start of pipeline construction activities, an evaluation of the project's potential impacts to cultural resources will be required. The evaluation will be based on results of the field inventory and will be performed in consultation with the SHPO, BLM, and the Advisory Council.

Construction

Cultural resources that could be impacted by the proposed project include archaeological and historic sites that are located in areas which would be directly or indirectly affected by project construction and facilities operation. Sites located within the pipeline right-of-way will be exposed to potential direct and indirect impacts, while sites located outside the right-of-way will be exposed to potential indirect impacts only.

Direct impacts will result from actual surface disturbance of a site's spatial configuration or stratigraphy during project construction. For example, pipeline construction activities, including clearing and grading, ditching, hauling and stringing, pipe placement, and backfilling, will disturb or destroy cultural resources. Disturbances by project-related vehicular activity within the project right-of-way and along access roads could also adversely affect near-surface cultural resource sites.

A beneficial impact will occur through the implementation of the field survey (identification) program implemented for the project. This information will be added to the cumulative body of information on settlement systems in an archaeologically poorly known area of California. The identification of these resources before construction begins may well prevent any adverse impacts, if the sites are avoided.

Evaluation of NRHP eligibility using the regulatory criteria is often complex and time-consuming. All cultural resources can make some contribution to regional research goals. The degree of that contribution is dependent upon the type of resource. Therefore, the level of data collection can be extremely variable, ranging from site recordation for bedrock mortar stations to data recovery programs for complex midden sites. These efforts can be minimized if cultural resource sites can be avoided by detailed project design and final route selection.

No ethnographic sites have been identified for the proposed route. This lack is not surprising given the paucity of ethnographic data for the study areas. Archaeological sites that have been identified along the proposed route are described below.

A survey of a proposed diatomite mining area, reported in 1978 by Ancient Enterprises, Inc., records several sites on or near the alignment in the far southern portion of the project area. These sites and the survey results regarding them are as follows:

CA-Ker-822 was recorded on the original alignment of the proposed route, but the most recent alignment skirts the recorded site area on the west. The report notes that site destruction was in progress at the time due to construction activities in the oil field. This has apparently been completed, as no sign of the site could be found on or near the alignment.

CA-Ker-823 consists of 40 rock piles regularly spaced over an area of 1,000 square meters. It lies west of the alignment. No such rock piles were found on the construction corridor.

CA-Ker-829 is a very large scatter (800 x 600 meters) of chert flakes and chipping debris, but the flakes are thinly scattered over this area--averaging one per square meter. The pipeline was originally designed to bisect the site, but the westerly rerouting has moved it to the edge of the site. This is an area of natural chert occurrence, so the site probably represents primarily a quarrying area. The only artifactual evidence found on the alignment in this survey was a small area (25 x 15 meters) containing 15 to 20 pieces of chert resulting from reduction of larger cobbles to more convenient size and shape, i.e., shatter and cortical flakes. None of the flakes showed secondary retouch or other indications of use as tools. There is no indication of depth of deposit or midden development. In the area of the alignment, at least, the only activity was quarrying, and even this was rare.

CA-Ker-836 is slightly mislocated on the Information Center maps, which show it on the proposed route. This plotting is reasonable, based on the information on the site record, but the survey report states that the site is 250 meters east of the dirt road that followed the pipeline, which was in place at the time of the survey. This road is adjacent to the current route, so the site is actually about 200 meters east of the route--well out of the construction zone.

Between CA-Ker-836 and CA-Ker-829, an area of about 2 miles, five sites were recorded near the proposed route: CA-Ker-846 to CA-Ker-850. These are actually isolated finds, each one consisting of a single artifact, with no associated artifacts or features. None were located during the current survey, which is not surprising, given the narrowness of the survey corridor and the wide area covered by the five artifacts.

Once north of the Ancient Enterprises survey area, the proposed route comes near three previously recorded sites. These are as follows:

CA-Fre-52, recorded in 1939 as a very large scatter of ground stone artifacts, which was directly on the proposed alignment. A later report identified a midden near enough to the recorded location that a separate site number was not assigned. The current survey located the midden, but found nothing on or near the alignment. Two conclusions are possible: either the site was once much larger, with all but the currently visible midden destroyed by quarrying and agriculture; or the site was slightly mislocated originally and the midden is identical with CA-Fre-52. In any event, the only remaining cultural resource in the area, the midden, is well off the proposed route on the opposite side of a paved road from the project area.

CA-Ala-441H is the remains of a historic ranch complex (it appears on the General Land Office Plat of the area), which was recorded in 1983. The proposed route passes along the far northeastern boundary of the site. A wind farm has since been constructed on the site area and no sign of historic structures or features was found in the construction area for the pipeline.

CA-CCo-500 was recorded by Peak & Associates in 1984 within the area of a proposed sanitary landfill. The original pipeline alignment passed through the site, but the most recent design passes around the site to the west. The site consists of a scatter of chert and obsidian flakes, and slightly west of this, a bedrock outcrop with ground grooves and two cupules, but no bedrock mortars. The alignment passes near the bedrock outcrop, but is outside of the construction zone.

The current survey recorded several isolated artifacts which are not significant in terms of impacts and one new site. PCJ-1 is the temporary field number for a scatter of artifacts directly on the proposed route in northern Merced County. The site consists of a pestle, a mortar fragment, two mano fragments, and a flaked cobble on the north bank of Mustang Creek. The area is densely covered with grass, and there is every possibility that more artifacts are present. There is no apparent midden development, but the possibility of deep deposits cannot be excluded.

Direct impact from trenching for pipeline installation will occur only at CA-Ker-829 and PCJ-1, but measures to avoid impacts can be taken. Impact might occur at CA-CCo-500 also, even though it is not within the construction zone, because it is on the most convenient (dirt) access road to the area, and construction equipment moving on and near this road could cause displacement of surface artifacts.

Operation

No significant impacts are expected after all of the terms of the Memorandum of Agreement are fulfilled.

Accidents

Due to the low probability of sites encountered in the field identification program and the small probability of a spill, no significant impacts on cultural resources will result.

Abandonment

Abandonment in place will not result in significant impacts.

4.2.13 Terrestrial and Aquatic Biology

The analysis of potential impacts to biological resources is based on information developed from a number of sources, including literature review, agency consultation, and the field survey. The field survey for this project was performed to provide input for biological assessment, and the relevant findings of the biological assessment have been integrated into this section. The description which follows considers impacts of construction, operation, accidents and abandonment on the terrestrial and aquatic biology.

(A detailed analysis of project impacts on listed and candidate threatened and endangered species is presented in the Section 7 biological assessment. That document is available for review in the BLM State Office and the SLC office in Sacramento.)

TERRESTRIAL BIOLOGY

For this analysis, impacts were considered to be significant if on terrestrial resources they would have any of the following effects:

- Change in species composition of established plant communities, with degradation of associated wildlife habitat values, through invasion and persistence of weedy plant species.

- Direct removal of vegetation in sensitive plant communities or alteration of conditions that are essential to sustain them (for example the hydrology of vernal pools, wetlands and riparian woodland), causing permanent or long-term reduction in community size, species composition, species distribution, and/or wildlife habitat values.

- Direct or indirect mortality to rare, threatened, or endangered plant or animal species, with associated reduction in recruitment to their population(s), or disturbance or loss of critical ranges or habitats of state or federally listed rare, threatened, or endangered plant or animal species, as well as for candidate, proposed, or otherwise designated "special status" species not officially listed as endangered (e.g., raptors).

- Long-term damage to or reduction in plant communities and associated habitat values caused by a major accidental discharge of oil or frequent spills.

Construction

Vegetation

Clearing of vegetation for construction in the right-of-way will cause short-term and long-term loss of habitat. Following construction, all of the 80-foot-wide construction zone will be revegetated and about two-thirds of the right-of-way will approach the vegetation present prior to construction. Some areas, including a 30-foot-wide maintenance right-of-way, will be kept free of woody vegetation, and booster station sites will be paved. This will result in a permanent loss of habitat in saltbush scrub and alkali sink habitats often dominated by woody shrub species. The 80-foot-wide construction corridor will be temporarily cleared of vegetation in all habitats, except where sensitive features require a narrower corridor or special construction considerations. This will result in a permanent loss of habitat in saltbush scrub and alkali sink habitats often dominated by woody shrub species. The temporary and permanent loss of each habitat type occurring along the route due to construction is presented in Table 4-24. The location of sensitive features is shown on Figures 3-5 to 3-13 in Section 3.2.13.

Revegetation of valley grassland, saltbush scrub, and oak savannah habitats will be initiated during the first rainy season following construction. In the southern region of the project area, where desert-like climate and soils permit slow successional changes, natural revegetation of woody vegetation (e.g., alkali sink and saltbush scrub vegetation) will be a slow process. Recovery could be inhibited by competition for limited moisture from annual and pioneer weed species that can quickly become established and persist in disturbed areas. In this case, project construction will have a significant impact on existing communities in general, except where these are already disturbed (e.g., approximately 96 miles combined agricultural and disturbed land).

Removal of the natural vegetation during construction is significant when it impacts special communities and special status vegetation. The following potentially significant impacts on the vegetation of such special sites have been identified.

Biological Communities of Concern

Vernal Pools. Near the Byron Hot Springs Natural Area (see text below), the construction right-of-way approaches the western edge of a vernal pool at milepost 227.2. Although the construction right-of-way skirts the margin of the vernal pool site, incidental disturbance will result from construction activity and the hydrology sustaining the pool could be impaired; these would be significant impacts.

Riparian Habitat. Riparian trees provide nesting sites for birds such as mourning doves and loggerhead shrikes which feed in surrounding areas. Shade from the trees also maintains reduced water temperatures in the streams and provides refuge from summer heat for diurnal animals. Along Garzas Creek, Quinto Creek, Orestimba Creek, an unnamed creek at milepost 242, and Marsh Creek, riparian habitat will be affected by project construction. Most of the streams crossed have low to no riparian value; as such, they will not be significantly impacted by the project. However, clearing of grass and shrub vegetation will cause short-term habitat loss. Revegetation of stream banks after construction will reestablish grass and shrub vegetation, and no long-term significant impact will occur. The removal of mature trees will cause long-term habitat loss. On Orestimba Creek, up to six mature sycamore trees could be removed by construction; this constitutes a significant impact. The impact on the riparian vegetation of Pacheco Creek is described under wetlands below.

Wetlands. If at the time of construction the project route traverses any of the small freshwater marsh habitats commonly associated with irrigation facilities (e.g., irrigation ditches and

TABLE 4-24: HABITAT LOSS IN ACRES SAN JOAQUIN VALLEY PIPELINE AND ANCILLARY FACILITIES

Habitat Type	Pipeline Temporary	Pipeline Permanent	Booster Stations Temporary	Microwave Sites Permanent	Utility Lines and Access Rooms Temporary	Utility Lines and Access Rooms Permanent	Total Temporary	Total Permanent
Saltbush Scrub	177.0	106.2	--	--	--	--	177.0	106.2
Alkali Sink	44.8	26.9	--	--	--	--	44.8	26.9
Valley Grassland	1,190.7	0	9.0	.6	14.0	7.0	1,190.7	16.6
Oak Savannah	21.2	12.7	--	--	--	--	21.2	12.7
Riparian	7.3	4.4	--	--	--	--	7.3	4.4
Freshwater Marsh	10.9	6.5	--	--	--	--	10.9	6.5
Brackish Marsh	0.5	0.3	--	--	--	--	0.5	0.3
Disturbed	111.5	66.9	--	--	--	--	111.5	66.9
Cultivated	468.5	281.1	6.0	.6	35.0	17.5	503.5	305.2
TOTAL	2,032.4	505	15.0	1.2	49.0	24.5	2,067.4	545.7

SOURCE: Environmental Science Associates

ponds), construction would cause short-term habitat disturbance. Since the project, as proposed, will not affect the water sources and the hydrology of these areas will be restored, no significant wetland impacts will result.

Construction will result in the temporary loss of 0.5 acres of brackish marsh on Pacheco Creek. Restoration of the creek banks and the original hydrology of the diked and undiked portions of the marsh after construction will permit natural reestablishment of cattails, sedges, pickleweed, saltgrass, and rabbit foot grass which characterize the present vegetation.

If the berm of excess soil from the trench area is left on the right-of-way in wetland areas such as these, it might change the hydrology and have an impact on the wetland vegetation by trapping silt and by creating slightly drier soil substrate or more prolonged drought when water levels are normally low. Any permanent modification of the hydrology and siltation regime of Pacheco Creek and downstream marshes attributable to construction could contribute to the degradation of the brackish marsh habitat, resulting in a significant impact.

Oak Savannah. It is possible that a small number of mature oaks (mileposts 237, 238.2) will need to be removed during construction. Natural revegetation would be hampered by grazing activities. Due to the value of oaks for wildlife, the loss of these trees is a significant impact.

Listed and Candidate Plant Species

Botanical surveys were conducted to determine whether the listed and candidate plant species described in Section 3.2.13 are present in the project area. For two listed species, palmate-bracted bird's beak and Colusa grass, no suitable habitat was identified and no incidental occurrences were located. Neither of the two were found to occur in the study area. Candidate species with potential to occur within the study area are: Suisun aster, San Joaquin saltbush, Bakersfield saltbush, Lost Hills saltbush, slough thistle, hispid bird's beak, delta tule pea, and Mason's liliaeopsis. None of these species was located in the project area during the intensive field survey work; therefore, the project will have no significant impacts on these species.

It was not possible to conduct surveys for the giant fiddleneck, Crampton's tuctoria, and the delta coyote thistle, which are listed species, due to the timing of the 1986 survey. However, suitable habitats were identified and surveys for these species will be conducted in 1987. Surveys for the following candidate plants species will also be conducted in 1987: furcate fiddleneck, California jewel flower, Congdon's eatonella, Kern mallow, Hoover's wooly star, bearded allocarya, and caper-fruited tropiocarpum. Although their presence on the right-of-way is uncertain, potential impacts of the project on these species include the incidental loss of individual plants, and/or the extirpation of local populations of any of these species. These would be significant impacts.

Wildlife

Construction will cause direct mortality of small numbers of animals, primarily small mammals, amphibians, and reptiles. Those species with limited mobility to avoid construction activities will experience a short-term decline in populations in the immediate project vicinity. However, animal populations will return to and repopulate the disturbed area following revegetation. Most of the smaller animal species which could be affected by pipeline construction activities have high reproductive potential and are common in surrounding habitats (excluding special-status species discussed below). Therefore, loss of individuals is not considered to be a long-term significant impact. Larger mammals, birds, and reptiles will be able to leave the project area and avoid construction impacts. Impacts to these animals will be minor and insignificant.

Given the long, narrow configuration of the right-of-way, the local areas of impact for most wildlife habitants are small. The short-term displacement of animals from the corridor is not significant. These losses will be compensated for by normal recruitment after construction and will be insignificant. Some disturbed habitat will require a long period of time to return to pre-project conditions. As stated above, under vegetation, the loss of any trees will have a significant impact on wildlife using this cover.

Direct and indirect mortality will have significant impacts on certain special status species. The significance is dependent on the species' ability to respond to losses in population numbers, habitat, and other factors. This depends also on factors limiting special status populations under normal conditions (i.e., in the absence of the project).

For example, many areas traversed by the pipeline are described as "marginal" habitat or "prime" habitat for species of concern. Prime habitat provides all the essential life cycle needs in sufficient quantity to maintain long-term viable populations of a given species. Marginal habitat either is naturally deficient in fulfillng these needs, is degraded, or occurs in small patches that are not large enough to meet all the requirements of the species to maintain viable populations. However, marginal habitats are sometimes used as a temporary cover by individuals on a transitory or on a seasonal basis.

Each special status species is addressed individually, and the loss of potential habitat for state and federal listed wildlife species is presented in Table 4-25. Locations are shown on the figures included in Section 3.2.13.

San Joaquin Kit Fox. Kit fox occurs in low numbers along the pipeline corridor. Thirty-nine potential kit fox dens were observed within the pipeline corridor. If any of these were occupied during

TABLE 4-25: POTENTIAL HABITAT LOSS (ACRES) FOR LISTED AND CANDIDATE WILDLIFE SPECIES

Habitat Type	Kit Fox		Blunt-nosed Leopard Lizard		Giant Kangaroo Rat		Tipton Kangaroo Rat		San Joaquin Antelope Squirrel		Salt Marsh Harvest Mouse	
	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
Saltbush Scrub	177.0	106.2	177.0	106.2	177.0	106.2	0	0	177.0	106.2	--	--
Alkali Sink	44.8	26.9	44.8	26.9	44.8	26.9	44.8	26.9	44.8	26.9	--	--
Valley Grassland	1,190.7	16.6	403.3	2	212.3	0	--	--	80.1	3.3	--	--
Oak Savannah	--	--	--	--	--	--	--	--	--	--	--	--
Riparian	--	--	--	--	--	--	--	--	--	--	--	--
Freshwater Marsh	--	--	--	--	--	--	--	--	--	--	--	--
Brackish Marsh	--	--	--	--	--	--	--	--	--	--	.5	.3
Disturbed	--	--	--	--	--	--	--	--	--	--	--	--
Cultivated	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL	1,412.5	149.7	625.1	135.1	434.1	133.1	44.8	26.9	301.9	136.4	.5	.3

SOURCE: Environmental Science Associates

construction, direct mortality could occur. This direct individual mortality would be a significant impact to kit fox populations.

Evidence of kit fox foraging in saltbush scrub, valley grassland, and alkali sink habitat was found. The permanent loss of about 150 acres (Table 4-25) of potential habitat will result from pipeline and ancillary facility construction. This estimate includes terrain with slopes greater than 30%, which is too steep for the kit fox. While the acreage is small, it is significant because of the cumulative impacts in the region due to widespread agricultural development of kit fox habitats.

There will be a temporary loss of habitat of about 1,400 acres (Table 4-25) due to clearing and construction. As this area will be revegetated, habitat suitability will be restored for the kit fox and it will not have a significant long-term impact to kit fox populations.

Blunt-nosed Leopard Lizard. Results of the survey indicate that the pipeline traverses blunt-nosed leopard lizard marginal habitat. Evidence of the presence of lizards in the survey area was limited to one carcass found at the entrance to a beechy ground squirrel burrow. This indicates the potential presence of the lizard in the area. Due to declining population, low densities, and low reproductive potential, any loss of individuals is considered to be a significant impact. Even though the blunt-nosed leopard lizard is known to inhabit active oil fields where suitable habitat remains (Kato and O'Farrell 1985), the temporary loss of 222 acres of saltbush scrub and alkali sink habitat is significant, since it takes several years before the woody vegetation is reestablished. The long-term loss of this habitat affects 135 acres and it is significant for the same reason.

Giant Kangaroo Rat. No evidence of the giant kangaroo rat was found during the corridor field survey nor was prime habitat for the giant kangaroo rat encountered. Based upon potential habitat impact calculations derived from giant kangaroo rat range maps (Table 4-25), about 435 acres could be temporarily lost and 133 acres permanently lost. Since the lost acreage does not represent prime habitat, no significant impacts (loss of individuals or habitat) will occur as a result of pipeline construction.

San Joaquin Antelope Squirrel. Construction of the pipeline in antelope squirrel habitat could result in direct mortality to individuals that would be buried in burrows or run over by vehicles. Although significant in the short-term, the loss of individuals is not expected to have a long-term significant impact to San Joaquin antelope squirrel populations, because the reproduction from areas immediately adjacent to the right-of-way will compensate for these direct losses.

Pipeline construction will temporarily remove about 300 acres (Table 4-25) of antelope squirrel habitat. When this area is revegetated, it will be recolonized by antelope squirrels from the surrounding habitat. Consequently, this habitat loss is significant for

San Joaquin antelope squirrel populations only in the short-term, and will not have a significant long-term impact.

Pipeline construction is predicted to permanently remove 136 acres of antelope squirrel habitat (Table 4-25). This is a significant impact to antelope squirrel populations, in terms of the cumulative effect of widespread agricultural conversion of native vegetation in the region.

Salt Marsh Harvest Mouse. Pipeline construction will result in the temporary loss of 0.5 acres of brackish marsh along Pacheco Creek, which is potential salt marsh harvest mouse habitat. The harvest mouse is known to occur in marshes less than one-half mile from the project crossing (CNDDB 1985). Any loss in this habitat will constitute a significant impact. Any modification of the hydrology and siltation of the creek and downstream marshes attributable to construction could also contribute to the degradation of the salt marsh habitat, resulting in a long-term significant impact on this listed species.

California Clapper Rail. Clapper rails are not known to occur in the pipeline corridor or in the neighboring marshes. No impacts from construction will occur.

Black Rail. The pipeline crosses a small area of potential black rail habitat at Pacheco Creek. No black rails were heard or seen during the corridor survey. The closest known black rail sighting is over 1 mile from the proposed pipeline. Pipeline construction will temporarily remove one-half acre of potential black rail habitat. This will not be a significant impact to black rail populations provided siltation caused by construction across Pacheco Creek and hydrological modification do not affect the downstream marshes where the rail is known to occur.

Peregrine Falcon. Construction will cause a temporary loss of approximately 1,000 acres and a permanent loss of approximately 600 acres of foraging habitat. This species forages throughout California and is not restricted to the project area. There are no peregrine nesting areas within 1 mile of the pipeline corridor. No significant impacts to this species will occur.

The impacts which follow pertain to several candidate species: Tipton's kangaroo rat, San Joaquin pocket mouse, striped racer, and the California tiger salmander.

Tipton's Kangaroo Rat. Tipton kangaroo rats were found in the alkali sink habitat north of Twissleman Road in Kern County. This vegetation community is prime habitat for the species (Williams 1985). Pipeline construction in this habitat could cause direct mortality by burying individuals in their burrows. This loss would be compensated for by recruitment from the surrounding alkali sink habitat. Thus, while this loss has significance in the short-term, it will not significantly impact Tipton kangaroo rat populations over the long-term.

Pipeline construction will result in the permanent loss of about 30 acres of habitat (Table 4-25). Although this figure is small, it is considered a significant loss of habitat for this species.

Development of alkali sink habitat for agriculture has left little remaining Tipton's kangaroo rat habitat (Williams 1985). Pipeline construction will result in the temporary loss of about 50 acres (Table 4-25) of Tipton's kangaroo rat habitat. After revegetation it will be reoccupied. Consequently, this temporary loss will not significantly impact Tipton Kangaroo rat populations.

San Joaquin Pocket Mouse. No evidence of pocket mice was found during corridor surveys. The distribution, taxonomy, and habitat requirements of this species are unclear and are currently undergoing revision and clarification (Williams 1986). Pipeline construction could cause direct mortality to individuals in their burrows. Pipeline ancillary facility construction will result in the long-term loss of about 150 acres of suitable pocket mouse habitat. There are large tracts of adjacent habitat along the corridor. This permanent loss of habitat will not be significant, as long as adjoining lands are not converted to agriculture or other developed uses.

Construction will result in the temporary loss of 1,400 acres of pocket mouse habitat (Table 4-25). Pocket mice will recolonize this area after it becomes revegetated. Thus any decline in pocket mouse numbers is expected to be slight, temporary, and insignificant.

Striped Racer. No evidence of this species was found during the corridor surveys. There are no known sightings within 1 mile of the pipeline route (CNDDB 1986). Pipeline construction will not have significant impact on this species.

California Tiger Salamander. No evidence of tiger salamanders was found during pipeline surveys. There are no known sightings of this species within 1 mile of the pipeline route. The survey corridor contains some wet areas which might provide habitat for the salamander. Pipeline construction may temporarily disturb these areas. However, construction will occur during the non-breeding season and will not have a significant impact on tiger salamander populations.

Raptors. During the field survey, golden eagles and burrowing owl were observed at several points along the route. The corridor does not include nesting habitat for golden eagles or other raptors. Construction will not impact nesting raptors.

Operation

Operation and maintenance of the pipeline will affect terrestrial habitats and wildlife, because the 30-foot-wide maintenance right-of-way will be maintained clear of woody vegetation. The routine monitoring of the pipeline for spills will be by air, with minimal vehicular traffic along the right-of-way expected. Occasional use of the right-of-way by vehicles for maintenance or repair and human activity around ancillary facilities will increase levels of disturbance to wildlife, but this, in itself, does not constitute a significant impact.

Periodic mowing, where it is necessary, will cause some mortality of less mobile animal species. It will not impact animals in their burrows, and the impact will be substantially less than that during the construction period. The San Joaquin kit fox, Tipton's kangaroo rat, and San Joaquin pocket mouse are nocturnal and will not be disturbed by standard right-of-way maintenance practices which do not include herbicide application.

The impacts of operations, which involve a long-term commitment of maintenance right-of-way on which cover will be limited to grasses, herbs, and small stature vegetation, have already been assessed as "permanent loss of habitat" impacts under construction. Maintenance will not impact the giant kangaroo rat, peregrine falcon, California clapper rail, black rail, striped racer, or California tiger salamander, because there is no evidence of their presence in the corridor. Other special status species such as the giant kangaroo rat, San Joaquin antelope squirrel, Tipton's kangaroo rat, and San Joaquin pocket mouse will compensate for any mortality caused by maintenance of the right-of-way through recruitment and by the natural balancing of other mortality factors.

The pipeline right-of-way will not significantly increase the accessibility of previously isolated areas to human disturbances. Thus, the present levels of wildlife disturbance, hunting, or illegal collecting of sensitive plant and animals species will be unchanged.

Accidents

Although the probability of a major oil spill is very small, it will significantly affect terrestrial resources on a short-term basis and could also cause significant impacts on a long-term basis. Vegetation will be destroyed. Animal mortality will occur, and animal life will be displaced or lost at least in the short-term. Any loss of special status plants and animals or their critical habitat will be significant. The extent and magnitude of the impact is dependent on the volume and location of the spill and the response time and cleanup techniques employed. Spill containment and cleanup operations will not cause additional impacts because these activities will be confined to the spill area. However, if the spill affects special status species it will have a long-term significant effect in spite of clean-up because of resultant minor or major modifications in the habitat (e.g., polluted topsoil will require collection and disposal and the site's ecology is changed). Not enough information is available to evaluate the long-term effects of a spill on terrestrial resources (see Section 4.2.15, p. 4-119).

Special status vegetation and the vegetation of special areas are stationary and cannot avoid the impact of a spill. The special status wildlife species include various burrowing animals. Oil will fill the burrows and trap these animals and their young, allowing no room for escape (San Joaquin kit fox, San Joaquin antelope squirrel, and candidate species like the Tipton's kangaroo rat and San Joaquin pocket mouse). The impact will be significant, especially where a spill is sufficiently large to impact several special status species and/or special habitats, such as brackish marsh and riparian communities. An estimate where major spills would cause the most impact because of concentrations of special status resources is provided in Table 4-26.

The following spill impacts are unlikely to occur in part because the probability of a spill is low and in part because these habitats

Table 4-26

BIOLOGICAL RESOURCES SENSITIVE TO OIL SPILLS BY MILEPOST

Milepost	Feature	Comment
2-17	Kit fox dens Saltbush scrub	Including natal dens
40-46	Wetlands and alkali sink	Most sensitive terrestriel habitat area
160-180	Valley grassland, Riparian habitat	O'Neil wildlife area Garzos and Orestimba Creeks
227	Vernal Pool(s)	
234-243	Oak Savannah	A few scattered trees
256-258	Brackish Marsh	Pacheco Creek Salt marsh harvest mouse

are not extensive. There is one vernal pool near the pipeline corridor (milepost 227.2). If an oil spill occurred near it, the spill and associated cleanup operations could entirely destroy the pool. As a contribution to the cumulative loss of vernal pools in the region, this will be a significant impact. Riparian areas are found in a few locations in the northern half of the pipeline corridor. Depending upon the size of the spill and the amount of water flowing through the area, a spill would be a significant impact to these resources. Wetlands are a scarce and diminishing resource in the region. An oil spill in or upstream of any wetland will be a significant impact on wetland resources in the region (mileposts 40-50).

Oak savannah occurs along the corridor in patches north of milepost 230. If an oil spill occurred in any of these patches, it could have sublethal effects or directly kill young oak trees or seedlings. Cleanup operations could also kill or damage the oaks by exposing root systems, burying root crowns, or by directly damaging the stems. There are only small patches of oaks along the line which could be impacted. Consequently, oil spills have a small probability of significantly impacting this resource.

A spill will not impact the peregrine falcon and the California clapper rail. The black rail and salt marsh harvest mouse could be significantly impacted by a spill in the Pacheco Creek area of brackish marsh habitat.

A direct oil spill impact on blunt-nosed leopard lizard individuals is not likely because the route includes only marginal habitat. The impact from a spill on the kit fox is more probable because the species is better represented and its habitat is more extensive than for the blunt-nosed leopard lizard. In the case of an oil spill, kit foxes could suffer direct mortality or loss of habitat. Fox dens are frequently located in ravines where spilled oil would be likely to collect into. Direct mortality could be significant depending upon the size, location, and time of an oil spill and the number of kit fox trapped in it.

Because the California tiger salamander and Alameda striped racer are not assumed to inhabit the right-of-way (since none were observed), and appropriate habitat for these species is limited within the corridor, significant impacts from an oil spill are not likely.

AQUATIC BIOLOGY

Impacts have been evaluated and considered significant if aquatic resources are affected as follows:

- Long-term (greater than one year or one life cycle) damage to or loss of essential habitat features (e.g., pools, riffles, aquatic vegetation, shade) for game fishes, native fishes, or threatened or endangered fishes such that an affected species' ability to reproduce and re-establish its population at pre-project levels is significantly lessened or jeopardized.

- Reduction in the population size of a game species or a native species or a threatened or endangered fish species to a level that reduces the species' ability to reproduce and re-establish populations at pre-project levels.

- Reduction of essential food sources (e.g., benthic invertebrates, aquatic vegetation, detritus) due directly or indirectly to habitat removal thus reducing the long-term sustainability of game, native, or threatened or endangered fish and wildlife populations (i.e., the food source either cannot re-establish at all or not sufficiently to support pre-project size populations of fish, amphibians, and other animals dependent on aquatic habitat).

The construction, operation, and abandonment of the pipeline on aquatic and potential accidents are evaluated in terms of these criteria.

<u>Construction</u>

Primary impacts to aquatic environments resulting from pipeline construction activities are caused by: (1) substrate removal, (2) increased sedimentation, (3) habitat alteration (e.g., change in stream bed elevation, contours, or flow), and (4) habitat degradation resulting from fuel or lubricant spills during construction. The potential effects of these primary impacts on aquatic biota include: reduction in plant and benthic macroinvertebrate abundance/ distribution; displacement to other habitat areas and/or possible reduction of resident fish populations; or reduction of fish populations as a consequence of covering, spawning, or juvenile rearing areas by sediment, eliminating these areas from the stream, or contaminating them by a major spill of potentially toxic materials, such as oil or lubricants.

In Pacheco Creek, construction may cause short-term impacts due to increased sedimentation and alteration of habitat conditions. Since these impacts will be short-term in duration (less than one life cycle for the fish and several months for other aquatic organisms), they will not have a significant long-term effect on aquatic populations. Similarly, in Marsh Creek, Garzas Creek, Orestimba Creek, and other intermittent creeks with evidence of aquatic organisms, construction will have a short-term impact which is not significant. The removal of any trees from the stream banks will have a significant long-term impact on the stream biota because it will reduce shale and increase water temperatures.

Although other streams throughout the project area are degraded or have limited aquatic resources, they present habitat that is in short supply. Project plans to construct during dry, low, or no-flow months, precludes significant impacts from occurring as a result of construction-related activities in the streambeds and in the associated riparian and aquatic habitats.

The water distribution facilities potentially affected by the proposed project include the California Aqueduct, Delta Mendota Canal, Pleasant Valley Aqueduct, Contra Costa Canal, and other unnamed canals. Installing the pipeline over and underneath the California Aqueduct and under the Delta Mendota Canal and other large canals and aqueducts (e.g., Pleasant Valley Aqueduct) will not impose any or long-term impacts on aquatic resources. Habitat will not be altered and aquatic organisms will not be exposed to potential contamination or disturbance during construction.

Operation

Operation of the pipeline will not have significant adverse impacts on the aquatic environment, nor will right-of-way maintenance during operations adversely impact the aquatic environment. At perennial stream crossings, any required major repair of the pipeline system would have approximately the same impact as construction since the pipe would have to be reinstalled. This impact will be insignificant to the same extent as described for the construction impact.

Accidents

The principal and potentially significant impacts during the operation of the pipeline would result from an oil spill in the vicinity of the Suisun Bay marshes or directly into Pacheco Creek, although the probability of a spill is relatively low. The level of impact to aquatic resources, in terms of impact duration and length of stream reach affected, would depend on the quantity of oil spilled, time of year, physical characteristics of the stream (e.g., bottom substrate, flow channel configuration), containment and cleanup, and on the relative abundance and sensitivity of the dominant or important aquatic organisms to oil.

After oil has been oxidized and chemically degraded, aquatic communities will generally be able to return to prespill conditions by recolonization from unaffected areas. The recovery period from a single occurrence is usually several months for benthic macroinvertebrates and several months to two years for fish (Cheremisinoff and Morresi 1977). Repeated occurrences, however, would expose the affected habitat to potential chronic toxicity.

Studies on a crude oil spill in the North Platte River near Glenrock, Wyoming, showed that benthic macroinvertebrates were almost totally destroyed, but no fish mortality was observed (EPA 1982b). However, fish flesh did exhibit disagreeable odor and taste for about two months after the spill. Oil concentrations in the river surface ranged from 2.8 to 8,195 milligrams per liter (mg/l) immediately after the spill, but went below 10 mg/l after seven days. The EPA study (1982b) also showed that macroinvertebrate communities recovered at most sites after two months.

Toxicity studies using water-soluble fractions in crude oil have shown that salmonids, striped bass, and slimy sculpin are quite sensitive to oil, while channel catfish and bluegill appear to be tolerant. The negative effects of a spill would persist longer in small streams because of limited flushing. Therefore, the impacts of an oil spill will vary significantly, depending on the size of stream, time of year, species in contact with the oil, duration of the oil spill, and the volume of the spill.

A major spill at or near stream crossings could cause significant impacts whether or not a stream were flowing at the time of the spill. At either a dry or flowing stream channel, cleanup of a major spill would require removal of contaminated soils, thus altering the streambed and potentially affecting aquatic and terrestrial wildlife use in the subsequent wet season if the stream were seasonally dry. Soil in the stream channel could also remain as a source of contamination of water quality until the oil broke down or was washed from the site.

Installing the pipeline across the California Aqueduct and the Delta Mendota Canal on existing suspension bridges will expose aquatic communities with limited resource value to potential oil spills during project operation. While not stocked or managed for recreation, these facilities do support important recreational fisheries which are used by the public. These facilities do not provide spawning or rearing habitat which could be threatened by a spill, but an uncontained spill will cause a fish kill and deplete recreational species until water was cleaned and restocked by fish from the delta or with survivors in the canal system.

Abandonment

Abandonment of the pipeline in-place will not adversely affect aquatic communities along the project route.

4.2.14 System Safety and Reliability

This section addresses safety and reliability aspects of the proposed project. The analysis is based on a review of available preliminary project design documents, including descriptions of component or facility specifications and construction and operating procedures. The methodology consists of a systematic failure mode analysis of all possible accidents involving both the pipeline and the booster/injection stations and their causes, and includes a description of design and operating features which will minimize the potential for system failures and their effects on the environment and on public safety and health. The safety of microwave transmission facilities is also discussed. The analysis is based on preliminary information; detailed project design is in progress. An analysis of oil spill volume and potential is presented in Section 4.2.15.

Regulatory Setting

Applicable regulations include federal regulations for hazardous liquid pipeline safety contained in 49 CFR 195. These regulations specify minimum requirements for materials, design, fabrication, assembly, construction, operation, inspection, testing, and maintenance of pipelines transporting hazardous liquids including petroleum products. These regulations are enforced by the DOT Office of Pipeline Safety. The California Pipeline Safety Act of 1981 also applies to the project. This act imposes additional specific safety requirements on intrastate pipelines carrying hazardous liquids, including a time schedule for conformance to federal regulations, hydrostatic testing requirements, pipeline maps, contingency plans, and pipeline incident reporting. This state regulation is enforced by the California State Fire Marshall, or by a local agency designated by him. The present survey of potential system failures and the corresponding system safety features for the proposed pipeline project indicates that the project will comply with the safety requirements stipulated by both of these regulations.

The primary safety concerns include the potential for pipeline, truck, or rail accidents resulting in public safety hazards and facility accidents which cause fires or explosions.

Impacts relating to system safety are considered significant if:

- Facilities fail to meet any applicable design codes or regulations, such as those specified by API, the National Fire Protection Association, and relevant permits;

- Operating policies concerning security or fire protection do not conform to generally accepted industry practices; or

- A fire injures anyone.

These significance criteria were developed based on a review of previous EIR/EISs for similar pipeline projects, regulatory requirements, research information, and professional judgment of resource specialists.

The measures incorporated in the proposed project to reduce the potential risks are summarized below:

- Traffic controls such as flagmen and markers will be used. All major road and rail crossings will be bored rather than open cut. Access for emergency vehicles will be maintained.

- Booster stations will have the following fire protection and control systems for the gas turbine and heaters.

  The gas turbine will have a fire detection and suppression system within the unit enclosure. The fire system will use halon, a high quality, efficient, fire suppressant applied where delicate equipment could be damaged by fire fighting. This halon fire system will be incorporated into both the unit and the station programmable logic controllers to initiate emergency shutdown of both the pumping unit and the station in the event of a fire. The system will consist of temperature detectors, ultraviolet flame detectors, and a halon storage and discharge system. It will be designed to initiate pump unit and station shutdown when any of the temperature detectors or flame detectors actuates, indicating the presence of a fire within the unit enclosure. Upon initiation of pump unit shutdown, the enclosure vents will close and the halon charge will be released into the unit enclosure in sufficient concentration to extinguish the flame.

  The heaters will have a protective device system which will detect the presence of an abnormal fire within the unit. This system will be incorporated into both the unit and station programmable logic controllers to shut down both the heater and the station in the event of an abnormal fire within the heater. Since heaters utilize burners, the presence of a flame alone will not be sufficient to identify the presence of an abnormal (emergency) fire. The emergency fire detection system will consist of a temperature detector in the unit exhaust stack which will be activated when the stack temperature exceeds normal operating values. Upon actuation and initiation of emergency shutdown, heater process inlet and outlet valves, fuel valves, and inlet air dampers will be closed to eliminate the sources of combustion and extinguish the flame.

In addition to the automatic fire protection and control systems mentioned above, other fire protection equipment will consist of one 150-pound wheeled fire extinguisher and two 30-pound hand-held fire extinguishers. These extinguishers will be located within the control building and at key points in the station yard.

All operating and maintenance personnel will be trained in fire protection and in the use of basic fire fighting equipment. In addition, selected supervisory personnel will receive more extensive fire prevention and fire protection training as well as first aid courses dealing with the treatment of burns and other fire-related injuries.

- Security systems proposed for the pump stations and pipeline block valves include the following:

  - Six-foot chain link fences topped with anticlimb barbed wire.

  - Gates that can be locked when the pump station is left unattended.

  - A perimeter alarm system installed around pump stations which would sound a local alarm and alert the dispatcher. The dispatcher would then notify local law enforcement officers and company personnel.

  - The gates at the road entrance would be locked at all times if access to the pump station is by private road.

  Security for the pipeline itself would be provided by weekly aerial reconnaissance, in accordance with Section 451.5(a) of ANSI B31.4. These surveys will identify any potential right-of-way encroachments, pipeline exposure or mechanical damage, or other potential safety hazards.

Construction

No hazardous materials will be transported by truck or rail during construction; therefore, fires or explosions will not result. The only public safety hazards will result from ordinary (i.e., not involving hazardous materials) traffic accidents. Because of the relatively short duration of project construction, the relatively small number of vehicles involved, and the small number of vehicle miles, the likelihood of accidents involving construction equipment or trucks is very low. Therefore, the incremental risk during construction will be negligible.

Operation

Potential safety hazards are systematically shown on Figure 4-6 and evaluated below. Because of the physical properties of the crude oil to be carried in the pipeline, i.e., its high viscosity, low pour point, and high flash point, oil will not be a significant fire or explosion hazard. Data on the characteristics of the lube crude were not available, but it is considered to be comparable to the other crude oil. Therefore, the possibility and consequences of fires or explosions will be limited to those caused by natural gas at the gas-fired compressor station. The only significant fire hazards associated with the proposed project are the turbine units and heaters. The pumps, piping manifolds, control buildings, oil pipeline, oil storage tanks and microwave towers, and other equipment are considered low risk fire hazards.

A fire at a booster station could be caused by a natural gas leak together with an accidental ignition source. However, because of the fire protection and control system described above, it is unlikely that these events will occur simultaneously. If a fire were to occur, its consequences would be limited by the rapid detection and control systems described above. These systems, in combination with fire fighting equipment onsite, are adequate to contain a fire on the property.

The only possibility of an explosion would result from a natural gas leak in the enclosed portion of the station. A gas leak detection device is not included in the proposed project. If a gas leak continued undetected to permit gas accumulation inside the building, an explosion could result if an ignition source were introduced. The size of an explosion would depend on the amount of gas inside the building, with the maximum volume equal to the volume of the building. At worst the detonation effects of such an explosion could only extend a few hundred feet from the building; employees on site could be injured, a significant impact. Table 4-27 shows the distance from the nearest sensitive receptor for each booster station. As shown, all buildings are beyond the range of exposure hazard. However at SJV-4, Interstate 580 is within 300 feet, and at two other stations, small two-lane roads are within the explosion hazard range. Injuries to humans would result if one or more vehicles were passing by, which is a significant impact.

Range and grass fires caused by lightning and recreationists are common in the region; such fires could spread to pump stations. While the fire protection devices are adequate to control internally caused fire, significant impacts could result from naturally caused fires. In this regard, the use of herbicides on site as proposed is undesirable because it will leave dry, dead vegetation on site.

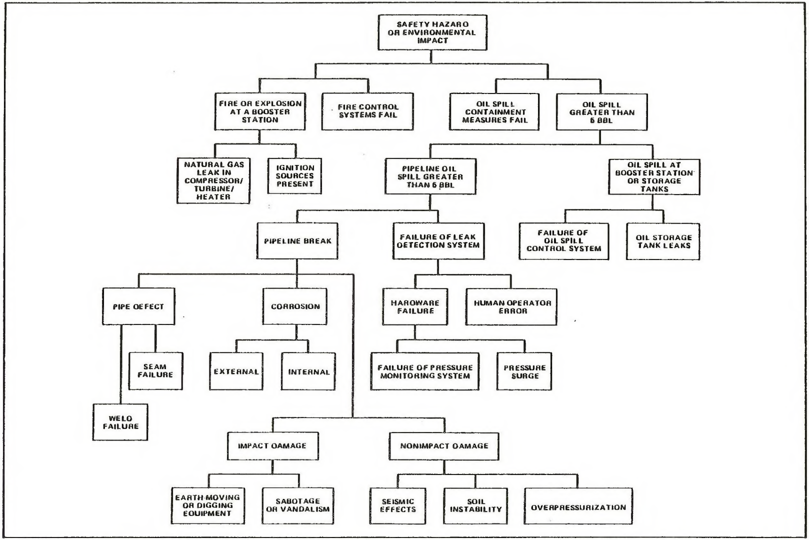


Figure 4–6 SIMPLIFIED FAILURE TREE FOR THE HEATED OIL PIPELINE SYSTEM

Table 4-27

PROXIMITY OF BOOSTER STATIONS
TO PUBLIC HIGHWAYS AND OFF-SITE BUILDINGS

Station	Closest Highway	Closest Highway (ft)	Distance to Nearest Off-Site Building (ft)
Kettleman	I-5	1,800	1,100
Mid	I-5	3,200	3,500
McKittrick	(secondary road)	100	500
Kernridge	(secondary road)	200	400
Caliola	I-5	over 5,000	3,500
SJV-2	I-5	over 5,000	over 5,000
SJV-3	I-5	over 5,000	over 5,000
SJV-4	I-580	300	1,000
SJV-2b	I-5	over 5,000	over 5,000
SJV-3b	I-5	1,200	2,500

Source: Ecology and Environment, Inc. 1986.

With the exception of the lack of a natural gas leak detection system, the proposed project minimizes the potential for system failures.

During the scoping process, a question was raised regarding the safety of microwaves used as part of the pipeline's communication system. Microwave transmissions will result in exposure limits that are orders of magnitude below allowable limits, which are in turn well below the levels known to produce biological damage. However, this is an area of scientific controversy. The approximately 6,000 studies conducted over the 40 years microwave technology has been in use have yielded inconsistent and inconclusive results. While no clear-cut damage to human beings from low-level radiation has been demonstrated, exposure to low levels of microwaves cannot be proved free of hazards (Foster and Guy 1986).

Studies of the possible biologic effects of electromagnetic fields, which includes microwaves, has been funded by the U.S. government at about $10 million per year during the 1980s. The results of these studies, and follow-up studies on significant results, may improve scientific understanding of biologic effects, but the controversy will likely continue for some years. The EPA is in the process of setting exposure standards. EPA's risk assessment process evaluates known hazards and builds in a safety factor. The controversy cannot be resolved in this document. According to present standards, the impacts are insignificant.

Abandonment

No significant safety hazards are associated with the abandonment of the pipeline.

4.2.15 Oil Spill Potential and Effects

This section describes the risks and consequences of possible oil spills associated with the operation and construction of the proposed project. The following subsections are based on a review of preliminary project design data and literature reviews and include:

- A description of the design features of the new pipeline that will prevent oil spills due to certain types of causes (see Operation);
- A summary of oil spill contingency/countermeasures/cleanup plans and an assessment of their adequacy to protect public safety and sensitive environmental resources (Summary of the Oil Spill Contingency Plan);
- Estimated probabilities of oil spills of various magnitudes for both the pipeline and the oil storage tanks derived from available historical statistical data (Oil Spill Probability);
- An estimate of the maximum possible oil spill size for the pipeline (Maximum Potential Pipeline Oil Spill Size); and

- A description of the exposure of potentially sensitive environmental target areas to spilled oil (Exposure of Potentially Sensitive Environmental Resources to Spilled Oil).

Regulatory Setting

The applicable regulations for pipeline safety were discussed in Section 4.2.14. The Clean Water Act prohibits discharges of oil or hazardous materials into navigable waters. The implementing regulations prohibit discharges that "violate applicable water quality standards or cause a film or sheen upon the surface of the water...." Because navigable waters is also broadly defined, virtually all discharges that would affect water are prohibited and reportable. Oil is not defined as a hazardous substance under the Comprehensive Environmental Response and Liability Act (CERCLA), and spills to land that would not affect water have no specific reportable quantities if they are contained and immediately cleaned up.

Impacts related to oil spill potential are significant if:

- An oil spill greater than 5 barrels occurs, or any spill to water occurs; or

- An oil spill injures anyone or damages or degrades biological resources, soil, surface water, or groundwater.

These significance criteria were developed based on a review of previous EIR/EISs for similar pipeline projects, regulatory requirements, research information, and professional judgment of resource specialists. In particular, small oil leaks to land are not considered to be a significant impact if they are less than 5 barrels. Any spill affecting water is significant because it is prohibited by statute.

Construction

Spills of oil or fuel may occur during construction. Based on past pipeline construction experience, such spills will not likely exceed 100 gallons (i.e., <3 barrels) and would therefore not be significant if no water resources are affected. However, impacts of any spills to water will be significant.

Operation

The various systems and measures incorporated in the proposed project to reduce the potential for oil spills and their consequences are discussed in Section 2 and recapped below; where appropriate, additional information is also provided.

- Geologic hazards along the pipeline route have been identified. Special design features that mitigate or eliminate potential pipeline damage resulting from fault movement, landslides, and other geological hazards are being incorporated into the pipeline design. The designs will conform to the applicable stress criteria of the American National Standards Institute (ANSI) B31.4. Design criteria will include internal design pressure, surge pressure, test pressure, vacuum, fluid inertia loads, temperature, external pressure (including overburden), and differential movement due to surface fault displacement, local liquefaction, or other loss of support.

- To prevent corrosion, the pipeline will be coated with an epoxy compound in accordance with applicable regulations (49 CFR 195). In addition, cathodic protection will be installed as required by 49 CFR 195, and in accordance with the time schedule specified by the California Pipeline Safety Act of 1981. Corrosion control test stations will be installed in order to test the integrity of the corrosion protection.

- To prevent overpressuring of the pipeline due to ambient temperature or operational upsets, the project will include a thermal relief system and a pressure relief system at pumping or booster stations, following the applicable design standard, ANSI B31.4. These systems will provide appropriate valves and sump tanks, as well as high-level alarms to prevent overflow of the sump. Flow switches on the relief lines to tankage will alert the 24-hour manned control center so that the controller will know that the fluid level in the tank is rising.

- Station overpressure/flow shutdown equipment will ensure that surges and line packing beyond the first cycle of generation will be prevented. The shutdown equipment will be designed to provide this protection even under conditions of communication failure.

- Three primary methods will be used to detect leaks: pipeline operator controller judgment, computer software detection tools, and air surveillance of the pipeline.

- All welds in sensitive areas such as waterway, railroad, or public road crossings, and 25% of all other welds, will be inspected by x-rays. The pipeline will be hydrostatically tested at 1.25 times the maximum operating pressure.

- A system of block (shut-off) valves including automatically operated valves at booster stations and manually operated valves at other locations will be used to shut down the system in the event of a spill.

- Other design measures will be used to prevent or minimize the occurrence of oil spills caused by third-party damage to the pipeline, or damage due to natural hazards. These include burying the pipeline following recognized industry safety practice, and aboveground marking or identification of the location of the buried pipeline. The pipeline will be buried a minimum of 3 feet deep, and deeper (5 feet) in farm areas, and its location will be marked by signs in accordance with DOT regulations (49 CFR 195.410). All stream crossings will be analyzed by the pipeline operator for 100-year scour depth prior to construction, and the pipeline will be buried below that depth. A concrete coating would be used at canal or stream crossings, and a pipe casing or sleeve used at road crossings.

Summary of Oil Spill Contingency Plan

Despite the engineering design, specifications, and safeguards built into the proposed system, the potential for oil spills still exists and additional containment and cleanup measures must be addressed. The oil spill contingency plan contained in Appendix B prepared by the applicant incorporates procedures for responding to an oil spill. These procedures include personnel training, an established communications network, standard reporting system, and defined responsibilities and lines of authority.

The purpose of the plan is to provide basic procedures to be used by company personnel in the event of hazardous liquid pipeline emergencies in order to minimize public risk. Property is to be protected, but only after the public has been adequately protected. In general, the plan complies with the regulatory requirements of 49 CFR 195.402(a) and (e), and the California Pipeline Safety Act of 1981.

The plan provides both alert and action procedures. The alert procedures for the handling of emergencies include notification of (1) company personnel, (2) outside companies where necessary, and (3) appropriate governmental agencies. The action or response element of the plan specifies containment and cleanup techniques specifically developed for the following special locations, topographic, or man-made features:

- Streams, creeks, and small rivers;
- Flood control channels and large rivers;
- Ship harbors and marinas;
- Storm drains;
- Street areas, intersections, and freeways; and
- Farm, ranch, or rangelands.

The specific containment and cleanup procedures adopted, after a leak has been detected and located, depend on whether the spill is in a confined (populated) or unconfined (rural) area. The first priority in a confined area is to ensure human safety, followed by appropriate containment and cleanup procedures. Containment and cleanup procedures utilized would depend on the size of the spill and surrounding terrain (flat terrain, steep slopes, depressions, streams or rivers, etc.).

On flat terrain, where oil would spread in all directions, dams or berms would be constructed around the perimeter of the spill. In steeper areas where the oil may spread by following natural drainage paths, the following techniques would be used to contain and divert oil:

- Blocking dams,
- Underflow dams,
- Diversion dams,
- Overflow berms, and
- Culvert blocking.

Cleanup procedures would generally require removal of soil or other natural substrates that become contaminated with oil. The motor grader/elevating scraper technique would be used for cleanup of relatively flat areas, except where trees or heavy vegetation creates difficulties. Steep slopes or uneven terrain often require a bulldozer or front-end loader for sediment removal. Excessively steep or rough terrain may be cleaned using low-pressure water flushing. This technique can also be used to remove oil from vegetation. On disturbed areas, reseeding and/or replanting would be undertaken as necessary to control erosion and return the area to a stable condition.

Oil which has formed pools in natural depressions or containment areas can be picked up with vacuum trucks. In less accessible areas, portable pumps discharging into barrels can be used. Sorbents may be used to remove small pools of oil, to clean light accumulations of oil from impervious surfaces, or to complete cleanup. There are two techniques involving pumping that apply to oil spill cleanup of groundwater: water flooding (flotation) and pumping oil water to the surface.

The containment and cleanup provisions of the contingency plan for roadways are specifically directed toward assuring both pedestrian and vehicular traffic safety in the event of a spill on a highway or road.

In general, the plan meets applicable regulatory requirements. However, it suggests the use of chemicals for dispersion of oil spills in water. Such uses require specific authorizations from EPA on a case-by-case basis, and this should be noted in the plan. The plan does not specifically identify sensitive features along the route (i.e., by feature and milepost) and the measures that would be employed at these locations. (See Exposure of Potentially Sensitive Environmental Resources to Spilled Oil.)

The causes of oil spills were systematically evaluated and are shown on Figure 4-6 in Section 4.2.14. As shown, the causes include seismic activity; pipeline corrosion; pressure surges; human operator error or delay in response; valve or sensor hardware failure; or breach of security allowing access to system facilities by vandals or sabotage.

Seismic Hazards. Pipeline loads resulting from seismic activity fall into three categories:

- Loads resulting from ground acceleration and consequent response spectra of the pipeline;

- Differential motion at surface faults; and

- A combination of the above.

Section 4.2.2 identified the locations of active faults having the greatest potential for effects of seismic activity on the pipeline. The proposed project includes completion of engineering analyses and special design features to reduce or eliminate potential pipeline damage from fault movement, landslides, or other geological hazards.

Nevertheless, the Concord Fault in Contra Costa County represents a hazard from faulting or surface rupture which could cause a pipeline break resulting in a spill exceeding 5 barrels.

Pipeline Corrosion Hazards. Corrosion protection is of critical importance. Pitting of the pipeline can occur due to chemical reaction between the soil and the carbon steel pipe if it is not adequately protected. This pitting will eventually reduce the strength of the pipe sufficiently to cause a break and allow oil to leak. Such spills are typically small.

The project's corrosion protection systems meet regulatory requirements and the probability of oil leaks caused by corrosion will be very small. (See discussion on Maximum Potential Pipeline Oil Spill Size.) However, if they occur, spills could be significant.

Pipeline Pressure Surges. The pressure relief systems meet regulatory requirements, and they are adequate to prevent pipeline breaks due to overpressurization, and no significant spills will result.

Pipeline Leaks. Quantification of the sensitivity of a pipeline's leak detection system is somewhat speculative. The ability to quickly detect leaks depends upon many variables in pipeline operation, including instrument accuracy, oil flow rate, operating pressure, and the characteristics of the crude oil.

The project's leak detection systems meet regulatory requirements. Recent data on spills at Shell operations shows that Shell's average spill sizes are smaller than industry average for the same pipeline diameters. Nevertheless, if the leak detection system fails, a spill larger than 5 barrels could result. (See discussion on Maximum Potential Pipeline Oil Spill Size.)

Oil Spill Spreading in the Environment. Block valves are planned no more than 30 miles apart along the pipeline, and at booster and injection stations. Also, manual block valves are proposed on either side of the stream crossing at Pacheco Creek in Contra Costa County (milepost 211.6). These systems as well as the Oil Spill Contingency Plan will limit the amount of oil spilled in the event of a leak or line break. Also, oil storage tanks will be provided with containment dikes or berms to limit the spread of spilled oil.

Oil Spill Probability

The data summarized below on the historical occurrence of oil spills is based on nationwide data from facilities similar to those proposed in conjunction with this project. This information is offered as representative of average potential oil spill volumes and probabilities of occurrence over the life of the project, irrespective of a specific location along the pipeline.

Historical data on pipeline oil spills has been analyzed by previous investigators in terms of both product throughput and miles of pipeline operational per year. For the purposes of this assessment, the probability of a pipeline spill is described in terms of the number of spills per mile of pipeline in operation each year, i.e., spills per mile per year. Data sources were oil spill studies conducted for the Northern Tier Pipeline EIS by the Oceanographic Institute of Washington (OIW 1978) as well as the EPA (1982a).

Table 4-28 shows the causes of U.S. pipeline accidents for both onshore and offshore oil pipelines of all types and diameters over the five-year period from 1971 to 1975 (EPA 1982a). As can be seen, the leading causes of pipeline spills are equipment impact (31%) and internal corrosion (31%). Pipeline flaws, including defective pipe and corrosion, accounted for 56% of the spills and 53% of the volume spilled. For spills due to pipeline flaws, internal corrosion is the largest cause. However, internal corrosion is characteristic of older pipelines constructed of different materials than those proposed for the project. The spill size associated with corrosion is substantially smaller than the spill size associated with seam failure, the second largest source of pipeline spills. The pipelines that are the source of the data in Table 4-28 include much older lap-welded pipe, which is prone to seam failure. In the category of impact damage, equipment impact accounted for the largest number of spills. The largest volume of oil spilled is also attributed to equipment impact ruptures.

The EPA (1982a) report also compares mean spill size to pipe diameter for pipeline accidents reported to the U.S. DOT Office of Pipeline Safety (OPS) during the period 1971 to 1975 (see Figure 4-7).

As can be seen from Figure 4-7, the average spill volumes for the pipeline industry in general were 5,100 barrels for 22- to 28-inch-diameter pipelines, and about 2,700 barrels for 14- to 20-inch-diameter pipelines. For comparison, data on actual operations of Shell Oil pipelines for 1975-1985 show average spill volumes of 2,900 barrels for 22- to 28-inch-diameter pipelines, and 445 barrels for Shell's 14- to 20-inch lines. These volumes, as well as those in Figure 4-7, include both the oil pumped out before shutdown of the pipeline, and the volume drained out by static head after shutdown. The smaller average spills from Shell Oil operations compared to industry pipelines in general are believed to be due primarily to Shell's policies and practices, and partly due to the different periods used for comparison.

Table 4-28

CAUSES OF PIPELINE OIL SPILLS BASED ON HISTORICAL U.S. STATISTICS

Cause	Percent of Spills	Percent of Volume Spilled
Defective Pipe		
• Seam failure	12	25
• Weld failure	4	6
• Other	1	4
Corrosion		
• Internal	31	12
• External	8	6
Impact Damage		
• Equipment impact*	31	26
• Excavation equipment	3	7
Nonimpact Damage		
• Natural causes**	4	7
• Flow control error	2	3
• Other failure	1	3
Other	3	1
TOTAL	100	100

* Includes data for all pipelines; equipment impact includes anchor dragging.

**"Natural causes" include damage from earthquakes. Only 4% of spills occur from natural causes, which would include landslides and a flood that may have been triggered by an earthquake. Data summaries do not specify earthquake-related spills as a separate category.

Source: EPA, 1982a, Petroleum Leak Detection Study.

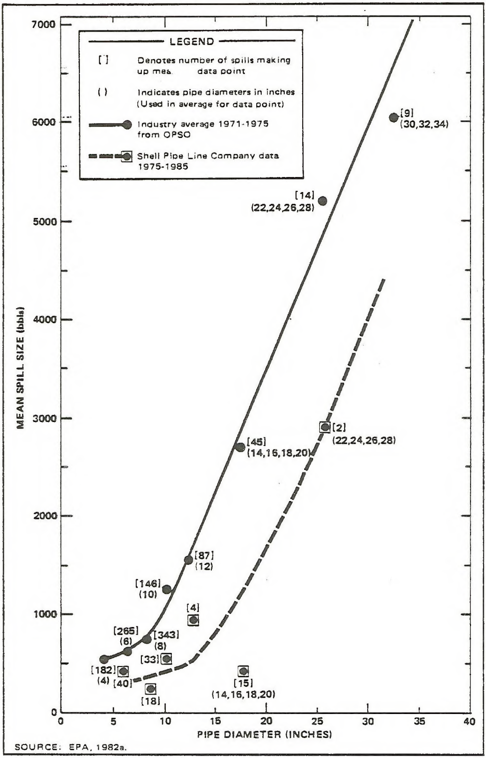


Figure 4—7 MEAN SPILL SIZE AND LINE PIPE DIAMETER FOR LINE PIPE ACCIDENTS REPORTED TO OPSO (1971-1975), WITH COMPARATIVE DATA FROM SHELL

The worst-case spill size could be considerably larger than the average sizes above (see discussion on Maximum Potential Pipeline Oil Spill Size below).

The OIW (1978) calculated spill rates based on the U.S. Coast Guard Pollution Incident Reporting System (USCG PIRS) data for the period 1973-1977. During this period, 1,580 spills greater than 2.4 barrels (100 gallons) in volume were recorded, in a cumulative total of 728,000 combined miles and years of pipeline operation. The inferred rate of spillage is 0.0022 spills of more than 2.4 barrels per mile per year and 0.0016 spills of more than 5 barrels per mile per year. The size distribution of oil spills stemming from accidents to onshore pipelines has been evaluated by OIW and is shown in Table 4-29. These figures are based on an average diameter of 10 inches for U.S. pipelines nationwide.

However, recent advances in pipeline construction technology and quality assurance/quality control procedures for both construction and operation will reduce the number of probable oil spills indicated by the above historical data. This reduction, attributable to new, preventive design features, can be used to estimate the probability of oil spills for the proposed pipeline, as follows. For comparison with the 5 barrel size, 50 barrels is also used to illustrate the lower frequency of larger spills. First, among the 1,580 spills counted in Table 4-29, the number of spills larger than 50 barrels is approximately 471. Hence, the probability of a spill larger than 50 barrels, without mitigating design measures, is 471 spills in 728,000 combined miles and operational years, or 0.00065 spills per mile per year. Based on recent industry experience with pipelines whose design and construction have incorporated such improved technology, it was assumed for the purposes of this analysis that 90% of those spills caused by corrosion and/or defective pipe will be prevented. Assuming 90% mitigation (prevention) by design of 39% of the spills due to corrosion (because of the corrosion protection system), and 90% mitigation of the 17% of the spills due to defective pipe (because of the quality assurance procedures for weld inspection and hydrostatic testing described above under Pipeline Spill Prevention Design Features), the number of spills larger than 50 barrels for new pipeline would be reduced by 50% to 236 spills. Thus, the probability of spills of this size would be 0.0003 per mile per year (236 in 728,000 combined miles and years of experience), or fewer than three spills over the life of the project.

For spills larger than 5 barrels, the unmitigated number of spills in Table 4-30 is 1,173, or 0.0016 spills per mile per year, as noted above. If the 50% reduction or mitigation of these spills is assumed due to pipeline design features and improved quality assurance, the estimated number of spills would be about 587 in 728,000 mile-years, or 0.0008 spills of more than 5 barrels per mile per year, or about six spills over the life of the project.

Similar estimates of oil spill frequencies may be made for the larger storage tank facilities at two of the booster stations, based on historical data. The OIW (1978) estimated the historical rate of

Table 4-29

LAND PIPELINE SPILL SIZE DISTRIBUTIONS

Spill Magnitude (barrels)	Number	Percent of Total Number	Volume (barrels)	Percent of Total Volume
2.4 - 10	582	36.8	3,682	1.0
11 - 100	754	47.7	30,298	8.2
101 - 1,000	198	12.5	63,562	17.3
1,001 - 10,000	41	2.6	147,541	40.1
10,001 - 100,000	5	0.3	123,091	33.4
TOTAL	1,580	100.0	368,174	100.0

Note: Includes only spills of 2.4 barrels or more between 1973 and 1977; U.S. nationwide average pipeline diameter of 10 inches.

Source: U.S. Coast Guard Pollution Incident Reporting System (Oceanographic Institute of Washington 1978).

Table 4-30

ESTIMATED PROBABILITIES FOR THE PROPOSED PIPELINE OIL SPILLS IN TWO SIZE RANGES

Spill Incidents for Proposed Pipeline*	Rate of Occurrence
Spill sizes greater than 50 barrels	
Over length of pipeline/year	0.08
Per mile/year	0.0003
Number of spills/life of project (40 years)	2.4
Spill sizes greater than 5 barrels	
Over length of pipeline/year	0.21
Per mile/year	0.0008
Number of spills/life of project (40 years)	6.2

*Relevant characteristics of the proposed project are:

Diameter (variable): 10, 14, 18, 24 inches

Length: 257.6 miles of new pipeline

Pipeline life: 30 to 40 years

Susceptibility to various causes of failure (mitigated by design):
- resistant to corrosion
- less vulnerable to material defects such as weld or seam failures

Source: Ecology and Environment, Inc. 1986.

oil spills from onshore crude oil storage tanks using a st^rage volume expressed in barrel-years. The rate is based on the USCG PIRS data for the period 1973 to 1976. During this period, 176 spills were reported, with a cumulative total of 6.98×10^8 barrel-years of storage. The rate applies to spills of more than 2.4 barrels in size.

A spill size frequency distribution of onshore storage facility spills was developed by OIW (1978) based on 176 incidents in the USCG PIRS data base. The fractions of spills exceeding specific volumes are shown in Table 4-31.

The probability of a spill greater than 5 barrels in size can be calculated from these data as 176 spills in 6.98×10^8 barrel-years, or 2.52×10^{-7} per barrel-year. Similarly, using the fractions of spills in each size range shown in Table 4-31, the probability of spills in each size range may be calculated. These are presented in Table 4-32, together with the average numbers of spills in each size range to be expected over a 30-year project life, for the existing 30-MBBL storage tank at the Weir station, and for the 80-MBBL proposed storage tank at the Mid station. Because of the relatively small storage volumes, the expected numbers of spills from these facilities are quite low.

However, even these spills are unlikely to pose a threat to the environment because of containment within the diked or bermed area. For the proposed 80-MBBL storage tank at the Mid station, a berm is proposed that will have a containment volume of 113% of the tank volume. The existing 30-MBBL storage tank at Weir station also has a containment berm surrounding the tank that at 110% of tank volume meets regulatory requirements.

Maximum Potential Pipeline Oil Spill Size

The amount of oil spilled as a result of a break in the pipeline would depend on the extent of the failure, the location of the line break in relation to mainline block valves, the elevation profile and diameter of the pipeline segment between the break and the nearest block valves, and the time required for the human operator in the pipeline control center in Anaheim to detect a potential leak and to react and activate the appropriate remote-control shutoff valves or dispatch a man to close a manual block valve. Following a leak, pumping during the time required for leak detection, isolation, and valve shutdown, as well as residual line drainage by gravity through the break, would contribute to the total volume of oil spilled. Line drainage is likely to be the largest contribution, as shown by the calculations below.

The maximum (worst-case) volume of crude oil that would be pumped from the pipeline before detection by the controller at the Anaheim control center (see Section 4.2.14) will be approximately 870 barrels. This leak volume could only occur during about 2 hours per week, when the pipeline flow rate will change to accommodate movement of a special lube crude. The following assumptions were used in estimating the worst-case leak volume:

Table 4-31

VOLUME DISTRIBUTION OF OIL SPILLS
FROM ONSHORE STORAGE TANKS

Facility Spills* Spill Volume (barrels)	Fraction of Spills in this Size Class**
>10	0.642
>100	0.148
>1,000	0.011
>10,000	0

*Estimates based on Table IV-2 of OIW 1978.
**Fractions apply to the class of spills >2.4 barrels in size.

Source: Oceanographic Institute of Washington 1978.

Table 4-32

CURRENT AND FUTURE PROBABILITIES OF
OIL STORAGE TANK SPILLS IN SEVERAL SIZE RANGES

Spill Volume (barrels)	Probability of Spill per Barrel-year of Storage*	Storage Volume (Mbbl)		No. of Spills Over 30-year Project Life	
		Wier Station	Mid Station	Wier Station	Mid Station
>10	2.52×10^{-7}	30	80	0.2	0.6
>100	5.7×10^{-8}	30	80	0.05	0.14
>1,000	4.9×10^{-9}	30	80	0.004	0.012
>10,000	0	30	80	0	0

*Probabilities of spills in each size range determined from historical data in the Northern Tier Pipeline EIS (Oceanographic Institute of Washington 1978); see Table 4-24.

Source: Ecology and Environment, Inc., 1986.

• Instrument inaccuracy (±2%, at 6667 bph)	266 BBL
• Line pack variation (80 MBD to 160 MBD within 60 minutes)	300 BBL
• Tolerance to prevent false alarms	84 BBL
• Controller decision/reaction time (2 minutes)	220 BBL
Total	870 BBL

The worst-case spill volume before detection during the remaining 166 hours (99%) of the week would be less, only 570 barrels. Volumetric imbalance due to line pack would not be a factor during this period. Volumes due to instrument inaccuracy, false alarm prevention, and decision/reaction time would be the same as above.

These two worst-case (pumpage) scenarios are hypothetical. The calculated volumes above include only the oil which would be pumped out of the pipeline before the leak would be detected and the pipeline shut down, and do not include the volume that would drain out after shutdown due to static head.

For comparative purposes, the maximum pipeline drainage volume, i.e., worst-case size, that is possible for each segment of the pipeline was calculated by determining the length of the longest section of pipe that drains downslope between valves (by examining the elevation profile of the line as shown on the location maps), and multiplying by the cross-sectional area of the pipe corresponding to the diameter in that segment. These estimated maximum spill volumes are shown in Table 4-33. It can be seen that, since essentially all of Segment 2 (from Kernridge to Mid station) is downhill (21.6 miles), this segment could theoretically result in the largest volume of residual drainage following valve closure, namely 36,000 barrels, assuming the break occurred at the worst location, i.e., at the bottom of the downslope just before the Mid station. (By comparison, it could be noted that for a break at the "average location," i.e., halfway between Kernridge and Mid stations, the line drainage would correspond to only about 10 miles of pipe, and would therefore be only about 18,000 barrels.)

It should be noted that these hypothetical worst-case line drainage volumes are based on the assumption that entire lengths of pipeline several miles long between valves which drain downslope would completely drain following a line break. In fact, it is quite possible that the heavier crude oils from Kern River or Tulare, which have pour points of 40°F and 25°F, respectively, would tend to solidify or "clot" at ambient temperatures following a pipeline break (especially in winter), thereby limiting continued outflow of oil. The fact that the actual historical average spill sizes for Shell pipelines quoted above, i.e., less than 2,900 barrels, are much smaller than those in Table 4-33, would be consistent with this possibility. Only the lube crude, which has a pour point of 5°F, could actually flow sufficiently at ambient temperatures to result in a major spill involving extensive

Table 4-33

MAXIMUM POTENTIAL OIL SPILL SIZE
FOR EACH MAJOR PIPELINE SEGMENT

Proposed Segment	Diameter (inches)		Maximum Length Between Valves that Drains Downslope (miles)	Maximum Oil Spill Volume* (barrels)	
	Proposed	Alternative		Proposed Diameter	Alternative Diameter
Weir-Kernridge	10	--	6.5	3,300	--
Kernridge-Mid	18	--	21.6	36,000	--
Mid-Caliola	14	24	4.3	4,300	12,700
Caliola-Martinez	24	20	8.0	24,000	16,500

*Based on residual pipeline drainage by gravity following pipeline valve closure, i.e., does not include pumping during human operator diagnosis, reaction, or valve shutdown times.

Source: Ecology and Environment, Inc., 1986.

line drainage. Since this lube crude will only be pumped through the pipeline 1.5 days per week, the likelihood of such a large line drainage occurring is correspondingly reduced.

This analysis is refined to specific locations of waterway crossings along the proposed route in the next subsection.

Exposure of Potentially Sensitive Environmental Resources to Spilled Oil

The most important environmental resources near the proposed route that are considered at risk from an oil spill are the various waterways crossed by the proposed route, especially the aqueducts. Based on the locations of these crossings, maximum oil spill volumes were estimated for each area, based on the local diameter and elevation profile of the pipeline and the locations of the nearest shutoff valves, as was done in the previous subsection. These estimates are shown in Table 4-34. Note that the proposed action includes overhead crossings of the California Aqueduct at milepost 160.7 and of the Delta Mendota Canal at milepost 164.1. Again, only line drainage following valve closure is considered, since pumping during the time required for human operator response and valve closure will be variable, and smaller. It should be noted that manual block valves are proposed on both sides of Pacheco Creek, and that these are assumed to limit the spill size into this waterway.

Potential oil spill impacts on other sensitive resources are summarized in Table 4-35. Sensitive biologic resources which would be adversely affected by oil spills are shown on Table 3-31. Whereas the specific locations of some features can be identified by milepost, the kit fox, a special status species, is fairly equally distributed along the route south of Contra Costa County. The Oil Spill Contingency Plan should be updated to provide for these sensitive resources. Despite the potential for large oil spill volumes in these sensitive areas following a pipeline break, evidence from previous spill incidents suggests that environmental impacts on such resources may be of short duration.

In general, most of the oil industry's work on the fate and effects of oil spills has been on marine ecosystems, because inland spills are readily cleaned up, in part by intense microbial activity in soils, especially in warm areas. Inland spills have not been comparatively studied; most evaluations are case histories. For example, the only paper on inland oil spills given in recent years at EPA's national emergency response conference was a case history of a well-documented pipeline rupture at Glenrock, Wyoming. This study indicated that short-term impacts can be severe, but the ecosystem is resilient and can recover when aided by rapid and effective cleanup efforts.

4.3 ALTERNATIVE ROUTES

This section identifies impacts that will occur as a result of the construction and operation of the two alternative routes: the Combination Route and the Contra Loma Route. The Combination Route replaces the looped segment (Segment 3) of the proposed route between

Table 4-34

ESTIMATES OF MAXIMUM POTENTIAL OIL SPILL VOLUMES
AT WATERWAY CROSSINGS

Waterway Crossed	Approximate Milepost	Pipe Diameter (inches)	Maximum Length Between Valves That Drains Downslope (miles)	Maximum Oil Spill Line Drainage Volume (barrels)
500 Canal	21.6	18	3.1	5,200
415 Canal	27.0	18	8.5	14,200
California Aqueduct	32.3	18	13.8	23,000
California Aqueduct	61.3	14	4.3	4,300
California Aqueduct	84.6	24	2.0	5,900
California Aqueduct	160.7	24	2.0	5,900
Delta Mendota	164.1	24	2.0	5,900
California Aqueduct	165.9	24	6.0	17,700
Pacheco Creek	256.1	24	0.2*	592

*Block valves are on both sides of Pacheco Creek, at mileposts 256.0 and 256.2.

Source: Ecology and Environment, Inc., 1986.

Table 4-35

SUMMARY OF POTENTIALLY SIGNIFICANT OIL SPILL IMPACTS ON SPECIFIC ENVIRONMENTAL RESOURCES

Report Section	Environmental Feature	Potential Oil Spill Impact	System Safety Features
4.2.3	Soils	Reduced crop productivity in irrigated agricultural areas, revegetation problems	Contingency plan to limit spread of spilled oil; shut-off valves
4.2.4	Surface water	Degradation of water quality in aqueducts at crossings	Contingency plan; shutoff valves
4.2.7	Socioeconomics	Potential for highway accident caused by oil spill on highway; property damage; lost crops	Contingency plan has specific provisions for spills on highways; SJVPLC will be responsible for cleanup and compensation
4.2.9	Land use	Short-term restrictions on use of land	Contingency plan for cleanup
4.2.12	Cultural resources	Potential damage or loss of one site which might be eligible for National Register	Proposed route to avoid or mitigate site (if eligible for National Register)
4.2.13	Terrestrial and aquatic biology	Short-term loss of habitat; short-term reduction of productivity; loss of endangered species	Contigency plan for cleanup; shutoff valves to minimize amount of spilled oil

Mid station and the Caliola booster station. The Contra Loma Route, a 3.5-mile bypass in Contra Costa County, is aligned about 0.5 miles to the north and east of a portion of the proposed route to avoid the rugged terrain traversed by the proposed route in this area.

The following sections compare the alternatives with the proposed route.

4.3.1 Combination Route

Geology and Topography

The Combination Route runs parallel to and close to the proposed route (not more than 1 mile distant). The area consists of broad alluvial fans and valley floor flood deposits. Slopes are low and geologic boundaries are indistinct. Because both the proposed and alternative routes are aligned very close to each other and cross the same formations, the geologic impacts are the same for each. There are no significant geologic impacts associated with either route.

All phases (construction, operation, accidents, and abandonment) of the project under this alternative will have the same impact as the proposed route.

Geologic Hazards

The Combination Route is subject to the same geologic hazards as the proposed route. These hazards consist of the possibility of ground shaking with an intensity of up to MMI VIII, and the possibility of soil liquefaction in the Mid station area (for about 5 miles) where perched water occurs at shallow depths during the irrigation season.

Neither the Combination Route nor the proposed route crosses faults in the Kern-Kings-Fresno County area. All phases (construction, operation, accidents, and abandonment) of the project under this alternative will be subject to the same geologic hazards as the corresponding portion of the proposed route through Kern, Kings, and Fresno counties.

Soils

Since the soils in Fresno County along the Combination Route are similar to those encountered by the corresponding portion of the proposed route, impacts will be similar. These impacts are related to salinity and the potential for revegetation failure on saline soils. The Combination Route crosses an approximately similar extent of saline soils as the proposed route, and these soils will require special rehabilitation procedures; i.e., revegetation with saline-adapted vegetation.

Construction, operation, accidents, and abandonment impacts are similar to those of the proposed route and are insignificant.

Surface Water

The environmental setting along the Combination Route is similar to the proposed route's corresponding portion, and therefore surface water impacts will be similar. The Combination Route crosses the same 20 intermittent streams as the proposed route.

All phases of the project (construction, operation, accidents, and abandonment) under this alternative will have the same impact as the proposed action. The impact of a spill would have the same significance along the Combination Route as along the proposed route, because this alternative route is in the same watershed as the project route, and a spill would enter the same watercourses.

Groundwater

The Combination Route crosses the same aquifers as the proposed route. Construction, operation, accidents, and abandonment impacts are the same as those for the proposed route and are insignificant.

Air Quality

Because the Combination Route alternative diverges only slightly from the corresponding portion of the proposed route, air quality impacts would be the same as described in Section 4.2.6.

Socioeconomics

The socioeconomic and transportation impacts of the Combination Route are similar to those described for the proposed route. No significant impacts will result. The number of workers required to construct this alternative will not differ substantially from those required to construct the portions of the proposed route it would replace. Because of the short duration of the construction period, the small number of non-local workers relative to the project area population, and the availability/capacity of existing infrastructure and housing, no significant impacts will result.

Operation, accidents, and abandonment impacts are similar to the impacts of the corresponding portion of the proposed route, and are insignificant.

Noise

Noise impacts along the Combination Route are similar to those of the proposed route for project construction, operation, accidents and abandonment. No significant impacts will occur due to noise.

Land Use and Recreation

Land use and recreation impacts along the Combination Route will be the same as those described for the proposed route. In Fresno County, the Combination Route does not deviate much from the proposed route. Seven miles of agricultural lands are traversed by both the alternative route and the proposed route. The Combination Route is adjacent and parallel to I-5, while the proposed route follows an existing pipeline right-of-way. Sensitive land uses along the alternative route are listed in Section 3.3.9. Table 4-36 shows the land uses traversed in Fresno County and the eight-county total for the alternative. The land uses for the Combination Route do not differ from the proposed route.

Construction impacts are insignificant. Loss of agricultural production is a short-term impact and the construction right-of-way will be returned to production after completion of construction.

Project operation, accidents, and abandonment under this alternative will have insignificant impacts, the same as for the proposed route.

Visual Resources

The Combination Route will have the same visual impacts as those described for the proposed route (see Table 4-37). Insignificant impacts will result from pipeline construction because the route crosses flat agricultural fields. The Combination Route lies immediately adjacent to the I-5 right-of-way; I-5 is a designated scenic route in this area, and construction over this alternative route would have significant impacts. However, this effect would be temporary, because upon restoration the right-of-way will not display a visual contrast with the croplands.

Operation and abandonment impacts will be insignificant and are similar to those described for the proposed route. An accident could cause a significant visual impact b^cause the Combination Route passes through VRM Class 1 and 2 areas. However, as with the proposed action, visual contrast caused by an oil spill would likely be of short duration.

Paleontology

Several vertebrate fossil localities have been recorded on or very close to the Combination Route. This route crosses some areas having high paleontological sensitivity, from milepost 61.3 to 67.4, and the potential for impacts over this area is high. However, sensitivity and potential severity of impacts are exactly the same as for the proposed action, because mileposts 61.3 to 67.4 are part of the area in which the Combination Route follows the same right-of-way as the proposed action.

Construction, operation, accidents, and abandonment impacts will be identical to those for the proposed route (see Section 4.2.11).

Cultural Resources

The probability of encountering significant cultural resources along the Combination Route is the same as that described for the portions of the proposed route it would replace in Kern, Kings, and

Table 4-36

LAND USES TRAVERSED BY THE COMBINATION ROUTE

County	Agricultural Land		Rangeland		Industrial/ Commercial		Shrubland/ Woodland	
	Miles	%	Miles	%	Miles	%	Miles	%
<u>Combination Route Only (Milepost 76.8 to 84.3)</u>								
Parallel to Existing ROW	7	100	0	0	0	0	0	0
Not Parallel to Existing ROW	0	0	0	0	0	0	0	0
<u>Fresno County with Combination Route</u>								
Parallel to Existing ROW	18	27.4	47	72.6	0	0	0	0
Not Parallel to Existing ROW	0	0	0	0	0	0	0	0
County Total	18	27.4	47	72.6	0	0	0	0
<u>Eight-County Total with Combination Route</u>								
Parallel to Existing ROW	41	16	168	65	9	4	10	4
Not Parallel to Existing ROW	16	6	11	4	3	1	0	0

Source: Data from Woodward-Clyde Consultants 1985.

Table 4-37

VISUAL IMPACT MATRIX FOR COMBINATION ROUTE

Milepost	VRM Class	Visual Contrast	Comments	Impact
Milepost 77 - 80	1	Low	Adjacent to a transmission line ROW	Insignificant
Milepost 80 - 84	2	Low	Partly adjacent to road ROW	Insignificant

Source: Environmental Science Associates

Fresno counties. That is, the entire alternative is of low-to-medium sensitivity except in the vicinity of its northern terminus (mileposts 79 to 81), where it is considered to have high sensitivity. However, field surveys failed to turn up any sites of possible significance over this 2-mile stretch.

Impacts to cultural resources are therefore the same as described for the proposed route for all phases of the project.

Terrestrial and Aquatic Resources

The Combination Route passes through similar habitats (valley salt brush scrub) as the proposed route. However, the Combination Route includes about 7 more miles of agricultural land. Near I-5, the alternative route passes through areas that are slightly more noise-disturbed than the proposed route.

In general, construction, operation, accidents, and abandonment impacts will be slightly less than those described for the proposed route, because the Combination Route avoids an area in which San Joaquin Antelope squirrels were observed, along milepost 43 of the proposed route. Additionally, from milepost 40 to 48, this route's proximity to I-5 would result in lesser impacts to biological resources than the proposed routing. From milepost 75 to 84, this alternative route would pass primarily through agricultural land, and would have no significant impacts on biology.

System Safety and Reliability

The system safety and reliability impacts of the Combination Route are the same as described for the proposed route (see Section 4.2.14). The same design codes, regulations, standards, and generally accepted industry safety practices apply to the alternative as to the proposed route. The possibility of an oil spill greater than 5 barrels, or of a fire at one of the gas-fired booster stations are the same and remain significant impacts regardless of whether the Combination Route or the proposed route is built.

Oil Spill Potential and Effects

The oil spill potential and effects for the Combination Route are essentially the same as described for the proposed route (see Section 4.2.15), since the same pipeline oil spill probabilities (i.e., number of spills per mile-year of pipeline operation) also apply to the alternative route. In addition, the maximum potential oil spill is the same for the Combination Route as for the proposed action.

Because this alternative deviates from the proposed route for only a small distance (less than 1 mile), the estimated response time required to dispatch personnel to close valves or to contain a spill is the same, i.e., about one hour (see Section 4.2.14). An analysis of the Combination Route shows that oil spills or leaks can occur as a result of the same types of causes, and have the same environmental effects, as the proposed route (see Section 4.2.15).

There will not be any significant spill or fire hazard during construction or abandonment, since these phases of the project do not involve major quantities of fuels or oils that would exceed the 5-barrel significance criterion at any one location.

4.3.2 Contra Loma Route

Geology and Topography

The Contra Loma Route diverges from the proposed route at milepost 240.67 and extends approximately 3.5 miles in a generally curvilinear course, approximately 2,000 feet north of the proposed route, rejoining the proposed route at milepost 244.35. The alternative avoids some of the steepest portions of the slopes encountered by the proposed route. The elevation of the terrain along the proposed route ranges from 400 feet ASL to 280 feet ASL, while elevation along the alternative ranges from 300 feet ASL to 180 feet ASL. Both the proposed route and the Contra Loma Route traverse the Markley Canyon. The high and low topographical features are less pronounced along the Contra Loma Route than the proposed route, since the terrain is less steeply dissected or is filled with alluvial deposits to a greater extent.

The Contra Loma Route avoids some areas prone to slumping and erosion between mileposts 242 and 244 of the proposed route. The Contra Loma Route will require less cut-and-fill during construction than the proposed action. Based on USGS topographical maps, the Contra Loma Route crosses five slopes in excess of 18% and six slopes steeper than 12%, while the proposed route traverses 10 slopes that are steeper than 18% and two slopes steeper than 12%, over an approximately similar 3.5-mile distance. However, only a fraction of the steep slopes are avoided by the Contra Loma Route because it is such a short alternative.

The Contra Loma Route will not have significant impacts on geology or topography during operation, accidents, or abandonment (see Section 4.2.1).

Geological Hazards

The Contra Loma Route traverses lower slopes and generally encounters less hard rock. It is subject to the same geologic hazard as the proposed route, i.e., ground shaking with a probable intensity of up to MMI VIII, but this is less likely to cause slumping or landslides than on the proposed route. The Contra Loma Route will traverse the same faults as the proposed route, including the active Concord Fault.

The risk of liquefaction may be slightly higher for the alternative route than for the proposed route because the Contra Loma Route traverses unconsolidated alluvial fan to a greater extent. However, this increased risk would still not pose a significant hazard for the pipeline, because the significant flat alluvial soils will not flow much on the level gradients on which they occur, even if they are liquefied.

Soils

In Contra Costa County, portions of the Contra Loma Route traverse areas of steep slopes through the Altamont-Diablo-Fontana soils unit which present a high erosion hazard. However, the Contra Loma Route avoids areas with a high potential for slumping and the erosion hazard is reduced overall because the alternative route crosses 15 to 30% slopes, while the proposed route encounters slopes of 30% to over 50% along the corresponding portion.

The Contra Loma Route crosses soils having a slight erosion hazard for about 66% of its length and the erosion hazard is moderate along the balance of this route. The soils have a high shrink-swell potential and high corrosivity, such as occurs along the proposed route.

Construction impacts are less significant than along the proposed route, since revegetation is expected to be more successful overall.

Operation, accidents, or abandonment would not result in significant impacts to soils. Maintenance of the right-of-way is facilitated along the Contra Loma Route, which traverses lower slopes and will have fewer revegetation problems. Slumping of soils during operations is less likely to occur along this route and poses less of a hazard to the system than the corresponding portion of the proposed route.

Surface Water

The Contra Loma Route traverses within 0.1 mile of the Contra Loma Reservoir; the proposed route passes within 0.5 miles of this reservoir. The Contra Loma Route traverses four intermittent streams in this area, the same as those crossed by the proposed route.

Construction of the Contra Loma Route at lower elevations and less steep topography will make it easier to control erosion and reduce the requirement for cut and fill on a few steep slopes. This will result in less sedimentation to streams crossed by the route.

The encroachment of the Contra Loma Reservoir increases the significance of a potential oil spill during operation of the pipeline. There will be less time to respond to a spill under this alternative because the route is located only 500 feet from the reservoir and the oil will enter the reservoir sooner than it would from the proposed route. The heavy crude would require more time to reach the reservoir if a spill occurred along the proposed route.

Groundwater

The Contra Loma Route does not traverse areas underlain by aquifers; therefore, there will be no impact assuming expeditious clean up. Any impact to groundwater could only occur if accidental spills or leaks were not cleaned up.

Construction, operation, and abandonment impacts are the same as those from the proposed route and are insignificant.

Socioeconomics and Transportation

The Contra Loma Route has similar socioeconomic impacts as the proposed route. The Contra Loma Route, however, traverses through a residential subdivision and its construction would require the removal of from 10 to 30 residences, depending on final alignment. The removal of homes would have a substantial adverse impact to the character of the neighborhood in which they are presently located. It will also cause adverse socioeconomic impacts associated with housing relocations. These are significant impacts. The distance which the alternative passes through or adjacent to this subdivision is about 4,500 feet. Construction would expose residents to the significant risk of potential accidents during construction; specifically, there would be conflicts between neighborhood activity, heavy machinery, and open trenches. Children could be particularly at risk.

Operation and abandonment of the Contra Loma Route would not have significant socioeconomic impacts. An oil spill over this route would be more likely to affect residential neighborhoods than the corresponding portion of the proposed route.

Noise

Noise levels of 65 dB(A) can be expected at 2,000 feet from the construction spread. This would cause a short-term significant impact on the Contra Loma Regional Park and residential area adjacent to this route alternative.

No noise impacts are associated with operation, accidents, or abandonment.

Land Use

Through Contra Costa County, this alternative traverses 2.5 miles of rangeland and 1.0 mile of subdivisions. It is aligned parallel to existing utility and transportation corridors for approximately 0.6 miles. The sensitive land uses along the proposed route are listed in Section 3.3.9. Table 4-38 shows the land uses traversed by the Contra Loma alternative. The Contra Loma Route crosses an existing residential area as well as an area proposed for residential developments. Although the Contra Loma Route avoids the Black Diamond Mines Regional Preserve (traversed by the proposed route for about 0.4 miles), it instead passes through a 1.4-mile portion of the Contra Loma Regional Park, an equally sensitive land use.

During construction, this route would disturb 9.2 acres of the Contra Loma Park. Additionally, the existing housing development and the proposed pipeline are conflicting land uses, representing a significant construction impact.

Table 4-38

LAND USES TRAVERSED BY THE CONTRA LOMA ROUTE

County	Agricultural Land		Rangeland		Industrial/ Commercial		Shrubland/ Woodland	
	Miles	%	Miles	%	Miles	%	Miles	%
Contra Loma Route								
Parallel to Existing ROW	0	0	0.6**		0	0	0	0
Not Parallel to Existing ROW	0	0	2.9*		0	0	0	0
Contra Costa County with Contra Loma Route								
Parallel to Existing ROW	1	3	19.6	53	3	8	10	27
Not Parallel to Existing ROW	0	0	3.4	9	0	0	0	0
County Total	1	3	23	62	3	8	10	27
Eight-County Total with Contra Loma Route								
Parallel to Existing ROW	41	16	166.6	64	9	4	10	4
Not Parallel to Existing ROW	16	6	12.4	5	3	1	0	0

*Includes 1 mile of residential development.

**Data from Woodward-Clyde Consultants (1985) adjusted to correspond with E & E estimate of 3.5 miles for total length of this alternative.

During operation, the permanent right-of-way would not affect the use of the 3.4 acres in Contra Loma Park that the pipeline would cross, because this area is developed parkland free of trees. Maintenance of the right-of-way will prevent reestablishment of residential areas and will thus conflict with surrounding residential uses for the life of the project. Upon abandonment, however, the land can revert to residential or other uses.

An oil spill within Contra Loma Park could flow into Contra Loma Reservoir, a public water supply storage facility which is also managed by the East Bay Regional Park District for water recreation. Such a spill would therefore have a significant adverse impact both on drinking water supplies and on recreational use of the reservoir.

Visual Resources

The Contra Loma Route would have a significant visual impact because it runs through the Contra Loma Regional Park and would be part of the scenery of the Black Diamond Mines Regional Preserve. Because the route is located within the middleground and background viewsheds of residential areas in the cities of both Antioch and Pittsburg, strong contrasts would be created, and visual impacts would be significant. The route specifically crosses steep hills covered with grasslands and widely scattered oak trees. The route would be a new visual pathway in the segment between Frederickson Lane and Somersville Road (see Table 4-39). The segment between Somersville Road and milepost 244.2 follows an existing transmission line right-of-way; it also passes along an oil tank area. Because of its proximity to residential areas and its location within a park, this alternative would have greater visual impacts than the proposed route in this area.

Paleontology

The Contra Loma Route is situated in an area of complex geology with potentially significant fossil resources occurring in the San Pablo and Wolfskill formations. Surveys of this route delineated four separate areas, totaling about 2.3 miles, for which construction could have significant impacts. These areas are summarized in Table 4-40.

Because of the geological complexity of north-central Contra Costa County, the portion of the route which the Contra Loma alternative would replace also has four small areas of potentially significant fossils (see Table 4-23). Therefore, there would not be any appreciable difference in construction impacts between the Contra Loma Route and the corresponding portion of the proposed route.

For the Contra Loma Route, operation, accidents, and abandonment impacts would be the same as described in Section 4.2.11.

Cultural Resources

As a result of the survey work, no cultural resources were found in the vicinity of the Contra Loma Route, and therefore the construction and operation of the pipeline through this area will not adversely impact such resources.

Table 4-39

VISUAL IMPACT MATRIX FOR CONTRA LOMA ROUTE

Milepost	VRM Class	Visual Contrast	Comments	Impact
Frederickson Lane to Somersville Road	1	High	--	Significant
Somersville Road to Milepost 244.2	1	Moderate	Adjacent to a transmission line ROW	Moderate

Source: ESA, Inc. 1986.

Table 4-40

SUMMARY OF PALEONTOLOGIC IMPACT SIGNIFICANCE ASSESSMENTS FOR THE CONTRA LOMA ROUTE

Location				Revised Assessment	
Milepost* From	To	Total Miles	Geological Unit	Potential	Impact Significance
0.3	0.5	0.2	San Pablo	High	High
0.5	1.0	0.5	San Pablo	Moderate	High
1.5	2.3	0.8	Wolfskill	Moderate	High
2.8	3.6	0.8	Wolfskill	Moderate	High
TOTAL MILES		2.3			

* The Contra Loma Route diverges from the proposed route at milepost 240.8; this milepost is defined as 0.0 for the Contra Loma Route.

Terrestrial and Aquatic Resources

The Contra Loma Route passes through similar habitat (oak savannah/grassland type) as the proposed route. However, the Contra Loma Route is aligned closer to development. Also, it follows 1.0 mile more of an existing corridor than the proposed route. Habitat restoration or revegetation will be easier than along the proposed route, because of less rugged topography. In a more settled and disturbed environment, the chance of conflict with special status communities, plants, or animals is substantially reduced. Special status plants, including the giant fiddleneck, Brewer's drawf flax, rock rose, and Mount Diablo manzanita, are of concern along this route, as well as along the corresponding portion of the proposed route. Construction impacts would not be likely to have a significant adverse effect on these species, because of the small area of suitable habitat the route would pass through. Operation and abandonment impacts will not be significant.

System Safety and Reliability

The information presented in Section 4.2.14 on system safety and reliability for the proposed route also applies to the Contra Loma Route. However, because this alternative route crosses a residential area for about 4,500 feet, it would have safety impacts not associated with the proposed action. Construction of this alternative route would expose residents to the significant risk of potential accidents resulting from heavy machinery used on the 80-foot construction right-of-way. The pipeline trench could also pose a safety hazard as long as it remained open, particularly to neighborhood children, who might be attracted to the construction equipment and activities.

Operation and abandonment impacts for this route would be the same as those described for the proposed route in Section 4.2.14.

Oil Spill Potential and Effects

The information presented in Section 4.2.15 on the proposed route applies to this alternative as well.

In addition, the proximity of the Contra Loma Reservoir (500 feet from the alternative route) is a major consideration, particularly because of the presence of a trace of the Concord Fault under nearby Pacheco Creek. This geological hazard presents a potential impact to the reservoir should an earthquake cause a spill. Under this alternative, a spill would reach the reservoir sooner than along the proposed route, which would cause significant impacts to drinking water and recreational use of the reservoir; and because the Contra Loma Route is on a north-facing slope, any oil spill on this route would flow north either towards the reservoir or towards existing residential areas. An oil spill into a residential area would cause property damage and require evacuation and dislocations from extensive cleanup.

Overall, in terms of oil spill potential and effects, an accident would be considered significant either for this alternative or for the corresponding portion of the proposed route, but would have greater adverse effects over the Contra Loma Route.

4.4 THREE NEW BOOSTER STATION ALTERNATIVE

This section identifies impacts that will occur as a result of the construction and operation of one additional booster station (SJV-4) and alternative site locations (SJV-2 and SJV-3) for the proposed stations SJV-2b and SJV-3b. This alternative will result in environmental impacts which are approximately similar to those described for the proposed action, with the exception that additional land will be required to accommodate the additional facility.

4.4.1 Geology and Topography

Disturbance to the geology and topography of the area of the new booster station will be insignificant because there are no major earth moving, cut and fill, or road construction activities involved. The alternative sites for the three new booster stations are not in geologically sensitive areas, and therefore will not result in significant geologic impacts.

Construction, operation, accidents, and abandonment will not have significant impacts on geological and topographical features.

4.4.2 Geological Hazards

The alternative booster station sites are not located in areas of geologic hazards such as liquefaction, landslides, or faults. However, the potential for ground shaking exists up to MMI VIII and would occur in the event of a major earthquake associated with nearby faults, such as the Calaveras, Hayward, or San Andreas faults.

Booster station SJV-3, located in Merced County, would be situated in a possible landslide bow (Woodward-Clyde Consultants 1986). A potential landslide hazard is present. However, the relatively level topography makes this an insignificant impact.

The maximum potential spill over Segment 4 would be reduced by several thousand barrels with implementation of this alternative, if it were used in conjunction with the 20-inch pipe over Segment 4. The probability that such a spill could result from a seismic event is low, however, just as it is for the proposed action (see Section 4.2.2).

4.4.3 Soils

The alternative booster stations would not impact soils significantly since construction zones will be revegetated and/or landscaped. The additional long-term land requirements for operation are addressed under land use in Section 4.4.9.

The soils that will be preempted by the facilities are not unique. SJV-2 and microwave No. 9 are on deep alluvial soil with a high shrink-swell potential. SJV-3 is located on the O'Neill-Apollo soils unit, which is well-drained, and SJV-4 is situated on the Chaqua-Carbona unit, which consists of deep terrace soils. Erosion hazards are minor even when the soil is erosion-prone because of the level topography of the sites.

Revegetation of the sites will be possible when these facilities are dismantled and the sites abandoned.

4.4.4 Surface Water

The alternative booster stations will not significantly impact surface water resources. Provisions for access, power, and water will mean that the construction of infrastructure requirements would cross several drainages. This impact is temporary and not significant. The sites are near intermittent, unnamed streams. The sites themselves lack surface water resources.

No operations and abandonment impacts will occur. Oil spill impacts would have the same effects as spills resulting from the proposed action over Segments 1, 2, and 3. If the 20-inch pipe were used over Segment 4, oil spill impacts would be less than if the 24- inch pipe were used over this segment.

4.4.5 Groundwater

The alternative booster stations would have the same insignificant impacts to groundwater resources as the proposed action (see Section 4.2.5).

4.4.6 Air Quality

The impact on air quality from construction is equal to that for the proposed system. Operation impacts for the three new booster station alternative would be insignificant for all pollutants, regardless of whether 20- or 24-inch pipe is used over Segment 4.

4.4.7 Socioeconomics and Transportation

The socioeconomic and transportation impacts under the three new booster station alternative would be insignificant just as they are for the proposed project. The construction of the one additional station (SJV-4) will require an additional labor force of approximately 45 people for 300 days. These personnel will be stationed in or near Livermore in Alameda County. The associated impacts are insignificant.

No significant impacts will occur as a result of operation and abandonment. The impact from accidents would be as described in Section 4.2.7.

4.4.8 Noise

In a rural setting, the noise from booster station construction will not be significant.

Even though the alternative will generate additional noise, the net impact from noise during operation will not differ from that of the proposed action because the alternative booster stations are not located in sensitive noise areas. The noise generated by the alternative booster stations will not be audible beyond a few hundred feet from their sources.

Abandonment would not create significant noise impacts.

4.4.9 Land Use and Recreation

The siting for SJV-2, SJV-3, and SJV-4 would permanently preempt land use on 22 acres that would not be preempted in the proposed action. These 22 acres include 6 acres of agricultural land and 16 acres of rangeland.

Land requirements for the alternative booster stations are given in Table 4-41. During construction, the booster stations alternative will affect 120 acres, including land for the three sites and all ancillary facilities, of which 64 acres are agricultural land and 56 acres are rangeland. This involves 49 acres more than the required acreage for the proposed action, but would not be a significant impact. About half the required acreage will be restored after construction. All these facilities will be on private land and will not impact public lands or recreation areas. The disposal of solid waste from construction will be in an approved landfill. Landfill capacity will not be significantly impacted, since only minor amounts of waste will be generated. The total waste will utilize less than 1% of the existing landfill capacity.

Operation of the facilities will preempt existing land use. The booster stations alternative (including all required microwave transmission sites) would displace about 32 acres of agricultural land and 28 acres of rangeland, a total of 60 acres; however, this is not a significant impact.

Because no highways or off-site buildings are located within the explosion hazard range of these stations, no significant impacts will result from accidents (see Table 4-27).

Upon abandonment of the facilities, the sites will be available for alternative land uses.

4.4.10 Visual Resources

The construction and operation of the booster stations alternative will have an additional impact on visual resources. The intrusion will be only moderately significant, because the additional station (SJV-4) is located adjacent to an existing pumping station and the site is partially hidden by the local topography from view from I-5, a designated scenic route. The booster station would create a strong visual contrast from a nearby residence and the impact is classed as significant for residents at that home.

The SJV-2 booster station and microwave station No. 8 will be located about 1.5 miles to the west of I-5 in Fresno County. I-5 is a designated scenic route in this area; the area is in VRM Class 2. The landscape in this area consists of flat agricultural fields with a

Table 4-41

LAND REQUIREMENTS FOR
ALTERNATIVE BOOSTER STATIONS

		Right-of-Way* (acres)		Land Use** Agricultural (acres)		Land Use** Recreational (acres)	
Feature	Facility	Operation	Construction	Operation	Construction	Operation	Construction
SJV-2	Booster station and ancillary facilities	20	40	20	40	--	--
SJV-3	Booster station and ancillary facilities	20	40	7	14	13	26
SJV-4	Booster station and ancillary facilities	20	40	5	10	15	30
TOTAL				32	64	28	56

*Estimated based on land required for SJV-2b and SJV-3b.
**Estimated based on aerial photographs.

large transmission line located west of the freeway and hills and grasslands further west. The booster station will be located in an agricultural field, adjacent to the power transmission line. No existing buildings are located between the booster station site and I-5. Thus, the station will have a fairly high degree of visual contrast to the landscape. A new 205-foot microwave tower will be constructed, which will be the tallest structure in the vicinity, visible from a great distance to numerous travelers on I-5 and from a residence more than 1 mile away. Both the station and the microwave tower represent a significant visual alteration of the landscape.

The SJV-3 booster station and microwave station No. 11 are located west of I-5, a designated scenic route, in hilly grasslands in Merced County. Few structures are located in this area (a ranch is located about 1 mile to the south), so that the station will present a high level of contrast to the landscape and will be highly visible from I-5. The impact will be significant. The access road and electric transmission line will present high visual contrast and will be visible in the middle distance view from I-5. These facilities will add to the significant visual impact of the booster and microwave stations.

Construction and operation of booster stations SJV-2, SJV-3, and SJV-4 and associated microwave towers will have less impact on visual resources than booster station SJV-3b, which is part of the proposed action and which is sited at a sensitive location.

4.4.11 Paleontology

Because alternative booster stations SJV-2, SJV-3, and SJV-4 would be located in areas of low paleontological significance, their construction and operation would create no significant impacts.

4.4.12 Cultural Resources

The cultural resources survey found no sites of significance at or near the sites for the three alternative booster stations. Therefore, this alternative would not have any impacts resulting from construction, operation, accidents, or abandonment.

4.4.13 Terrestrial and Aquatic Resources

Because alternative booster stations SJV-2, SJV-3, and SJV-4 would be located on disturbed or agricultural lands, their construction and operation would have no significant effect on biological resources.

4.4.14 Systems Safety and Reliability

The use of alternative numbers and locations of booster stations will not significantly change the system safety and reliability from that described for the proposed stations, since the same design codes, regulations, standards, and generally accepted industry safety practices will be followed for the alternative booster stations as for the proposed stations in Section 4.2.14. Since there will be more new stations under this alternative, the risk of a fire at any one of the gas turbines or heaters will be increased, but this increase is not significant in terms of a public safety hazard, because the risk would still remain very low.

Similarly, the use of alternative booster station locations will not significantly change the potential for a pipeline oil spill from that described for the proposed booster stations, since the probability of a spill per mile-year of pipe will not change. Further, the maximum potential oil spill volumes in each pipeline segment will not differ from those described for the proposed configuration in Section 4.2.15, except that use of a 20-inch pipe over Segment 4 would reduce the maximum oil spill over this segment by several thousand barrels. Personnel response times, shutdown capability, and oil spill contingency plan provisions also will not differ from those for the proposed station configuration.

Therefore, by applying the significance criteria used for the proposed configuration (see Section 4.2.14), i.e., the risk of fire at a booster station, or of a pipeline oil spill larger than 5 barrels, there are significant impacts of operation for the alternative booster station configuration, just as there are for the proposed configuration.

There will be no significant safety or oil spill impacts during construction or abandonment under this alternative option, since these project phases would not involve spills of quantities of fuels or oil larger than those adopted as the significance criterion; i.e. a spill larger than 5 barrels.

4.4.15 Oil Spill Potential and Effects

The three new booster station alternative, in combination with the 24-inch pipeline over Segment 4, would have the same oil spill impacts as described in Section 4.2.15. However, if the 20-inch pipe were used on this segment, the maximum oil spill potential would be reduced from Caliola to Martinez. The hazard of a natural gas explosion and fire are not associated with this alternative. The possibility of an oil spill involving the pipeline remains the same as for the proposed action (Section 4.2.15). Response time and implementation of the contingency plan would not be different from the proposed action.

4.5 ALTERNATIVE POWER SOURCE CONFIGURATIONS

The two alternative power source configurations are planned as integrated energy alternatives for the proposed action, which would not change otherwise. The environmental setting is the same and involves the two new booster stations SJV-2b and SJV-3b in Fresno and Stanislaus counties, respectively. The minor differences in environmental impacts are identified in this section.

4.5.1 Electric Motor and Natural Gas Heater

This alternative configuration involves a combination of electric motor-driven and natural gas-fired heaters. The environmental impacts associated with this alternative are similar to the impact of the proposed power source (natural gas turbine drivers and exhaust heat). This alternative does not eliminate right-of-way requirements for ancillary infrastructure. The requirement for electric power to drive the motors is in addition to the proposed action. However, the proposed configuration also involves an electric power line for the communication system and light at the facilities. Thus, the additional electric power is not associated with additional right-of-way to accommodate a new power line. The minor differences in impact are described below.

Noise

The electric motors will make twice as much noise but the noise levels perceived are a function of distance (see Table 4-14 in Section 4.2.8). The noise impact will be insignificant at a distance of several hundred feet from the station, near I-5. While SJV-3b is located near a sensitive land use and visual resources site, the noise environment is not sensitive near I-5.

Air Quality

Impacts from construction, accidents, and abandonment of this alternative would be the same as those described for the proposed power source configuration. However, this alternative would have different operational emission characteristics from the proposed action. The use of electric pump motors and gas-fired heaters at booster stations SJV-2b and SJV-3b would result in slightly less emissions than the proposed power configurations; in either case there would not be a significant impact.

4.5.2 Electric Motor and Oil-Fired Heater

The environmental impacts for this alternative, a combination of electric motor driver and oil-fired heater, are slightly different from those described for the proposed power configuration.

Land Use

This alternative does not require a right-of-way for natural gas lines, thus eliminating the requirement for 3.4 miles to SJV-2b in Fresno County and 0.4 mile to SJV-3b in Stanislaus County. No specific impacts are associated with this right-of-way requirement, and the reduction in impact is insignificant.

Noise

The noise impact is as described above for the other alternative power configuration (see Section 4.5.1). It is slightly higher than for the proposed acion. Consequently, the electric motor drive should only be used if final siting of the facility indicates that noise levels require mitigation.

Air Quality

The use of electric pump motors and crude-oil-fired heaters at these booster stations would result in operational SO_2 and TSP emissions to exceed thresholds of significance. SO_2 emissions would exceed the significance criteria for this pollutant by a factor of 7.

Visual Resources

The reduction of 3.8 miles in the right-of-way requirement for natural gas lines does not significantly change the impact described for the proposed action in Section 4.2.10. The reason is that rights-of-way and access roads and a power line are in any case associated with the booster station and microwave tower.

System Safety and Reliability

The use of oil as a fuel would require a minor additional requirement for piping, which slightly increases the potential for a minor spill at the facilities. These spills will be less than 5 barrels and insignificant. The use of electric power involves various hazards such as shorts, transformer burn-out, and electrocution. The hazard of a natural gas explosion and fire are not associated with this alternative. The possibility of an oil spill involving the pipeline remains the same as for the proposed action (Section 4.2.15). Response time and implementation of the contingency plan would not be different from the proposed action.

4.6 OVERHEAD AQUEDUCT CROSSINGS

Under the proposed action, only two of the eight aqueduct and canal crossings will be by suspension bridges, while under this alternative, the remaining six major aqueduct and canal crossings will also be via overhead suspension bridges. Impacts to geology and topography, geological hazards, soils, groundwater, air quality, socioeconomics, noise, land use and recreation, cultural resources, and paleontology will be the same as those presented for the proposed action (see Section 4.2). Potential impacts on other environmental features that would differ from those identified for the proposed action are described below.

Surface Water

The use of aerial suspension bridges for crossing all aqueducts and canals will avoid the slight potential of impacts from below-channel drilling, but will increase overhead stream construction and operations impacts. Construction of the suspension bridges and installation of pipe across them will create the potential for accidental loss of construction debris directly into the watercourse. This impact can be controlled so that it will not modify aqueduct flow characteristics, especially during periods of low flow. The most significant potential impact is that of damage to the suspended segment of pipe during operation. Oil would then spill directly into the affected aqueduct or canal until the shutoff. There would be no natural barriers or restraints which would prevent or delay the entire volume of the spill from entering the watercourse and grossly contaminating the water supply. The increased possibility of an oil spill into the aqueduct is considered a significant impact.

Terrestrial and Aquatic Biology

Installation of the pipeline across the canals and aqueducts on suspension brides will expose aquatic communities to the risk of a rapidly spreading spill if suspended pipe is damaged during project operation. While not stocked or managed for recreation, these facilities nevertheless support important recreational fisheries that are used by the public. These facilities do not provide important habitat (spawning or nursery) which could be threatened by a spill, but a spill could eliminate recreational fish species until water is clean and new fish are recruited from the delta. The increased risk of a spill that could affect these aquatic resources is considered a significant impact of this alternative.

Oil Spill Potential and Effects

Overhead aqueduct crossings will increase the potential for a pipeline oil spill over that described for the proposed underground crossings, since the pipeline will be exposed to above-ground hazards at these locations. The historical statistics on oil spills that were used to estimate the average spill probability per mile of pipe in Section 4.2.15 do not distinguish buried from above-ground pipelines, so this conclusion cannot be supported by data or quantified readily in terms of an increase in the probability of a spill.

The pipeline will be protected from vandalism or sabotage only by security fences on both sides of the aqueduct.

The overhead crossings would increase the potential for significant contamination of an aqueduct in the event of a pipeline break at one of these locations, since nothing prevents the oil from spilling in large quantities directly into the aqueduct. The probability of such an occurrence, however remote, will have to be considered also in terms of the small probability of a major seismic event, in which case more than one aqueduct crossing could be damaged simultaneously. Personnel response and oil spill contingency plan provisions for spills into streams, creeks, or rivers will not differ from these for the proposed action. Therefore, under this alternative, the potential for an oil spill larger than 5 barrels is increased, and remains a significant operational impact according to the impact criterion in Section 4.2.14. Minor oil leaks would be more rapidly detected at the overhead crossing than underneath the aqueduct.

4.7 NO-ACTION ALTERNATIVE

This alternative by itself would result in none of the environmental impacts described for the proposed project in Section 4. The environmental setting described in Chapter 3 would not be modified in any way, and there would be no impacts to any of these existing resources.

The no-action alternative could result in the use of other, completely different modes of transporting the 120 MBD of crude oil from the southern San Joaquin Valley to the refinery facilities at Martinez, since the only existing heated-oil pipeline, operated by Texaco, is near maximum capacity. Such alternative transportation methods include tanker, truck, and/or railroad transport, which have greater environmental consequences than the proposed action, particularly with respect to oil spill potential, air quality impacts, and energy consumption. In addition, each of these transportation modes would cost more than the proposed action.

The use of a tanker to ship oil to Martinez would still require a pipeline or truck or rail transportation capability to move the oil about 100 miles from its points of origination to the coast. Weir, Kernridge, Bakersfield, and Caliola are all landlocked. No existing heated-oil pipeline has the capacity to transport 120 MBD to either an existing or a hypothetical coastal tanker loading dock. A new pipeline would have to be constructed to move oil to coastal facilities, resulting in environmental consequences at least as significant as those described for the proposed action, since such a pipeline would have to be constructed over rugged terrain. The alternative to this, i.e., the use of truck or rail transportation to the coast, would be less efficient than a pipeline because of time, distance, and energy comsumption factors. Transport by tanker would require the construction of a new marine terminal and the modification of existing facilities to accommodate the 120-MBD throughput, with consequent major adverse impacts on coastal air quality and tanker traffic. These and other impacts associated with marine terminals are detailed in the Getty Gaviota Consolidated Coastal Facility Draft EIR, dated 1984.

Although statistics indicate that a pipeline spill is more likely to occur than a tanker spill, the volume of the oil spill resulting from a tanker accident would in all probability be much larger than for a pipeline spill (Oil Transportation Plan and Draft EIR, Energy Division, Resource Management Department, County of Santa Barbara, January 25, 1984).

The necessary above-ground transfers of oil between tanker and pipeline, truck, or railroad car, in conjunction with increased coastal tanker traffic, also would present risks in terms of collision, fire, and explosion, which are greater than those for a buried, landlocked pipeline system. A marine spill could have significant impacts on sensitive marine species and, under most conditions, it would be more difficult to contain and clean up than a spill on land.

Air pollutant emissions from tanker transportation would be greater than those associated with the operation of a pipeline. These emissions would derive from several sources, such as from fuel oil combustion, the fugitive hydrocarbon emissions which escape during loading and unloading operations, from storage areas, and from support vessels in the terminal area. The cost of shipping by tanker, after taking into account the cost of transportation from Kern County to the coast, would be substantially greater than the cost of a direct pipeline to Martinez.

Compared with the proposed action, truck or rail transportation from the southern San Joaquin Valley to Martinez would be impractical and would lack the system safety advantages of the proposed pipeline system. These transport options lack the required capacity, and the resources needed to implement them are not currently in place. An average of about 600 trucks per day (assuming a typical capacity of about 200 barrels per truck) would be needed to transport the 120 MBD of crude oil to Martinez. This large number of trucks would increase vehicular traffic on existing highways, increase total fuel consumption, produce significant air emissions, and increase highway safety risk. Using trucks, large oil spills would be less likely than for a pipeline system, but because of the large number of oil transfers involved in trucking (loading and unloading 600 trucks a day), the risk of many small spills, with their associated potential for fire or explosion, would be greater than for the proposed action.

On a per-barrel basis, the cost of trucking would be four to five times higher than for pipeline transportation. Train transport would be a less expensive option than trucking, but would still cost two to three times more than pipeline transportation. Assuming a 40,000-barrel train set capacity (72 cars per set), three full sets would be required to transport 120 MBD. A round-trip would take about 48 hours, including loading, hauling, unloading, and the return trip. The land and facilities required for loading and unloading three trains per day at each end of the run would be significantly greater than for the proposed action or for truck transport. The Belridge and North Midway-Sunset oil fields are not near any railroads, so connecting pipelines to the closest practical railheads, track-side storage, and loading facilities would be needed. In addition, rail transportation would result in significant air quality impacts from the locomotive exhaust, and would introduce the potential for small spills during loading or unloading or as a result of train accidents.

5. CUMULATIVE IMPACTS

Cumulative impacts of the San Joaquin Valley Pipeline project were assessed in combination with the proposed and likely-to-be-proposed projects described briefly in Section 2.5. These projects include oil and gas pipelines near Kern County under construction or expected to be built within the next two or three years; the projects in the cumulative analysis also include new power plants proposed to be built throughout the eight-county area traversed by the proposed action. It is difficult to quantify cumulative impacts, and in some cases it is difficult to define the precise location of cumulative impacts (for example, for air quality), because the exact timing of construction and the final operational characteristics of some of the projects included in the cumulative list are not known. Therefore, a worst-case qualitative analysis is used in this section to account for the greatest number and degree of cumulative impacts that could result from the construction and operation of the proposed action and all projects identified as interrelated to it.

In general, the cumulative impacts of the proposed action and the other pipeline projects listed would be limited to Kern County. Assuming overlapping construction schedules in Kern County, cumulative impacts could occur during construction to soils, surface water, air quality, socioeconomics, land use and recreation, paleontology, cultural resources, and terrestrial and aquatic biology. However, all of these effects would be temporary (except possibly with respect to biological, cultural, and paleontological resources) and therefore not significant. Cumulative operational impacts could affect socioeconomic conditions. They could also increase the potential for oil spills.

The cumulative impacts of the proposed pipeline and the energy development projects listed could occur during construction, but none would be significant during operation. These impacts would be to socioeconomics, land use and recreation, and terrestrial and aquatic biology. Cumulative effects are discussed below, by environmental feature.

5.1 GEOLOGY AND GEOLOGICAL HAZARDS

As identified in the seismic impacts section for the proposed action, the San Joaquin Valley Pipeline would not be subject to significant damage from earthquakes over the southern portion of the route. In addition, secondary effects from earthquakes, such as liquefaction and landsliding, are not expected to occur in Kern County due to the relatively flat topography and types of soils in this area. Although portions of the All-American, Pactex, and Angeles pipelines would pass through seismically active areas, these portions are not in the vicinity of the proposed action. The energy development projects listed in Table 2-12 may be subject to earthquakes or landslides, especially the Richmond Energy Recovery Project, but the effects of these projects would differ from those of the proposed action, so that cumulative interactions are unlikely. Therefore, it is concluded that the San Joaquin Valley Pipeline would neither have, nor contribute to, cumulative impacts resulting from geological and seismic hazards.

5.2 SOILS

Construction of the proposed pipeline and associated facilities will cause soil erosion and deposition, increase the potential for soil slumping, and decrease productivity due to compaction and soil horizon mixing after backfilling in those areas where topsoil is not segregated during construction. Similar impacts have been documented for the construction of the Pactex, All-American, Mojave, and Kern River pipelines, since all of these projects require trenching, occasionally through hilly areas prone to erosion. The proposed energy projects would be expected to cause some soil erosion during construction as a result of site preparation, loss of vegetative cover, and soil stockpiling. Cumulative soil impacts from overlapping construction schedules of all of these projects (a worst-case scenario) would be most pronounced in Kern County. However, projects such as the Lost Hills Biomass Plant and the West Valley, Angeles, Kern River, and Mojave pipelines, as well as enhanced oil recovery projects likely to result from these pipelines, would all be constructed in industrial/oil field areas with only slight elevation changes, where erosion is of less concern than in undisturbed hilly areas. The results of horizon mixing from the pipeline projects in Kern County, e.g., inconsistent vegetative regrowth and possible further erosion, and an increase of airborne particulates during the dry season, are likely cumulative impacts, but would be temporary.

No further cumulative impacts to soils would occur once the projects began operation and the pipeline rights-of-way are revegetated. Therefore, impacts to soils in Kern County, the area expected to have the greatest cumulative soil impacts, would be insignificant over the long-term.

5.3 SURFACE WATER

As with soils, the cumulative impacts to surface water resulting from the proposed action and the projects listed in Table 2-12 would be most pronounced in Kern County and would occur during construction.

Because the San Joaquin Valley Pipeline would be constructed across more streams and would affect more drainage basins than the construction of all the energy plants (except the Kern County and Lost Hills projects) put together, cumulative surface water impacts north of Kern County would be little more than those identified for the proposed action itself (see discussion in Section 4.2.4).

In Kern County, the worst-case scenario would involve simultaneous construction of the proposed action, the West Valley, Kern River, and Mojave pipelines, and the Kern County and Lost Hills generating facilities, during the rainy season. (The other pipelines are routed far enough south of the proposed action to be hydrologically separate.) If this were to occur, the increased sedimentation, erosion, and potential for spilling small amounts of grease, fuels, and solvents into intermittent and ephemeral streams between Fellows and Belridge would be cumulatively significant for the duration of simultaneous construction. These surface water effects could adversely affect plant and animal species adapted to the widely fluctuating conditions typical of the rainy season. Irrigation water, which is generally used only in the summer months when other sources of water are not available, would not be significantly affected by this scenario.

During operation, no significant cumulative impacts to surface waters would be expected to occur. Although very unlikely, if an accident were to occur that would cause spills in both the San Joaquin Valley Pipeline and the West Valley Pipeline, the synergistic impact would be potentially significant in degrading surface water quality. There is no reasonably foreseeable event that could cause such a simultaneous dual rupture.

5.4 GROUNDWATER

There would be no significant cumulative impacts to groundwater during either construction or operation of the projects listed in Table 2-12. Cumulative groundwater impacts from simultaneous oil spills in the proposed pipeline and the West Valley Pipeline systems (a very unlikely event) could pose a threat to groundwater, although the heavy San Joaquin Valley crude oils that would be involved have high viscosities, slow percolation rates, and would tend to remain at the top of the saturation zone. Also, as indicated in Section 4.2.5, the depth to groundwater in the vicinity of Segments 1 and 2 of the proposed action is normally over 20 feet. Moreover, the groundwater is not used for drinking water because of high TDS concentrations.

5.5 AIR QUALITY

The construction of the proposed action and the projects listed in Section 2 would result in many emission sources, including emissions from construction equipment, transportation needs, and fugitive particulates. Such air quality impacts would be spread out over a large area, even assuming that all construction occurred simultaneously, and would be temporary. Therefore, this does not represent a significant cumulative effect.

Operational air quality impacts would result, in the case of the oil pipelines, from injection and booster/heater stations; in the case of the gas pipelines, from compressor stations; and in the case of the power-generating projects, from direct stack emissions. Taken together, these projects cover a large area, and would emit a significant quantity of air pollutants such as SO_x, NO_x, CO, ROCs (reactive organic compounds), hydrocarbons, and particulates. However, the air quality regulatory environment in California is designed to prevent, as much as possible, significant cumulative air quality degradation. The California Air Resources Board has declared each of the eight counties traversed by the proposed pipeline, included in this analysis of cumulative impacts, as either in an attainment category or non-attainment category for five of the most common air pollutants. The permitting requirements for new point sources of pollutants in areas of attainment are governed by the Prevention of Significant Deterioration (PSD) permit, which specifies emission reduction strategies and applies if any pollutant levels exceed 250 tons per year. Permitting requirements are strict in areas of non-attainment, where triggering thresholds are lower than 250 tons per year per pollutant, and local air quality management districts generally require mitigation in the form of offsets. This means that for every unit of a pollutant that a project would emit, the project proponent must guarantee a corresponding reduction in that pollutant from somewhere else in the same air quality basin. With this regulatory system in place, the incremental air quality impact of each of the projects listed in Table 2-12, along with that of the San Joaquin Valley Pipeline, would be unlikely to cause cumulative air quality degradation.

5.6 SOCIOECONOMICS

As discussed in Section 4.2.7, construction of the San Joaquin Valley Pipeline would have only minor, temporary impacts on socioeconomic conditions in the eight-county project area. A maximum of about 400 local and 400 non-local construction workers might be at work over the entire length of the pipeline at any one time. By itself, this would have an insignificant effect on housing capacity, unemployment rates, or infrastructure capacity. However, in combination with the construction of those projects listed in Table 2-12 for Kern County, the proposed action could contribute to significant short-term cumulative impacts in Kern County's temporary housing supply, recreational areas, transportation system, and retail expenditures.

Assuming the worst-case scenario developed in Section 4.7.3, involving simultaneous construction of six projects in Kern County, it is estimated that 1,000 construction workers, about half of whom might be local, could be employed over a 20-mile radius. Although Kern County is accustomed to industries with transient employment such as oil and energy industries, such a concentration of workers could cause pressure on nearby accommodations and create traffic congestion along I-5 and other major transportation arteries. Construction vehicle traffic would contribute to this congestion and possibly cause temporary level-of-service deteriorations at key intersections. A more likely scenario would involve less overlapping construction schedules and locations, with a corresponding reduction in the severity of the above impacts.

In their off hours, non-local construction workers in Kern County would spend money on goods and services, thus having a positive effect on the local economy. Additionally, local construction workers would be hired predominantly from the local labor pool, thus significantly increasing the rate of employment in Kern County.

Throughout the eight-county project area, the only significant cumulative socioeconomic effect resulting from pipeline and power plant operation would involve greater tax bases for each of the counties. Initially, the assessed valuation of the San Joaquin Valley Pipeline would be $110 million, its total construction cost, with tax revenues distributed proportionally among the counties through which it passes. Because the projects listed as potentially interrelated to the proposed action are most concentrated in Kern County, this county would probably benefit the most from increased tax revenues. Significant long-term employment effects are not anticipated, because pipelines and small-to-medium-sized power generating plants are not labor-intensive in their operational stages.

5.7 NOISE

The proposed action would create minor and temporary noise disturbances during construction, as discussed in Section 4.2.8. Other projects whose construction noise impacts could potentially interact with those of the proposed action due to their proximity are the West Valley, Kern River, and Mojave pipelines. However, because noise levels drop sharply with distance from the source, even the construction of these projects would not occur closely enough together to create more than minor cumulative noise interactions. No foreseeable cumulative noise effects would result from construction along any other part of the San Joaquin Valley Pipeline route. Moreover, in all cases, operational noise levels would be lower than those produced during construction.

5.8 LAND USE AND RECREATION

The construction of the proposed pipeline and the projects potentially interrelated to it would create short-term impacts on land use and recreation. From Kern County north to Contra Costa County, but particularly in Kern County, construction of the projects listed in Table 2-12 would temporarily disrupt current land uses, mostly agricultural and grazing areas, by taking strips of cropland out of production, interrupting the visual unity of open areas, and creating minor traffic detours. Recreational areas in Kern County, such as Derby Acres Park and Lost Hills Park, could be used heavily by construction workers if all the Kern County projects on the cumulative list were under construction at the same time. Depending on the work hours of all the employees, use of recreational areas could hamper residents' enjoyment of these facilities. Such effects, however, are difficult to predict and likely to be temporary, if they occurred at all.

Cumulative operational impacts on land use and recreation would be minimal; the pipeline right-of-ways would in most cases be returned to their original uses, and permanent employment would be relatively small and would not have a noticeable effect on the use of recreational areas in the eight-county region. For the most part, the energy-generation projects identified in Table 2-12 would take up large parcels of land, but because these parcels generally occur in industrially zoned areas, their construction would be consistent with existing land use patterns and plans.

5.9 VISUAL RESOURCES

The greatest potential for cumulative impacts to visual resources would be in Kern County because of the number of pipeline and energy development projects scheduled for construction there. These projects would include the construction of booster stations, communication towers, and gas terminal distribution facilities, many or all of which might be visible from a single vantage point, since this part of Kern County tends to have low relief. However, as discussed in Section 3.2.10, most of western Kern County is designated as having low scenic value because of significant existing visual intrusions within many viewsheds. Therefore, the addition of more potentially intrusive visual elements in this area would not be expected to increase its visual contrast rating, and thus would not likely result in significant impacts.

The Stanislaus County Waste-to-Energy Project would be built adjacent to the proposed pipeline and I-5 near about milepost 186 of the proposed pipeline. However, cumulative impacts would not occur because this energy facility would not be built in a sensitive visual resource area, nor would it be within the same viewshed as the SJV-3(b) booster station and microwave tower No. 11, the nearest above-ground facilities associated with the San Joaquin Valley Pipeline.

5.10 PALEONTOLOGICAL AND CULTURAL RESOURCES

Construction of the proposed pipeline and the other pipelines listed on Table 2-12 could create cumulative impacts to paleontological and cultural resources in Kern County because of the trenching required to install underground pipes. Within the immediate vicinity of the Kern County portion of the San Joaquin Valley Pipeline, cultural resources sensitivity has been identified as low or low to moderate, while paleontological sensitivity is high to very high around the McKittrick tar pits. These determinations were made on the basis of professional investigations and field surveys, and are specific only to the proposed action. Significant cultural and paleontological resources, though they yield entirely different kinds of information and clues to the past, are similar in that it is difficult to predict their occurrence, other than in very general terms, without site-specific surveys and mitigation plans. Mitigation plans for cultural resources along the San Joaquin Valley pipeline will be developed in consultation with the Advisory Council on Historic Preservation and the California State Historic Preservation Office. If similar mitigation plans are developed for the other pipelines listed, cumulative damage to cultural resources in Kern County would be minimized. Aggregate effects are more likely in the case of paleontological resources even with mitigation and construction monitoring plans, because of the speed and volume of earth removal by trenching equipment and because mitigation standards are not as clearly defined for paleontological resources as for cultural resources.

Mitigation plans and test excavations, where warranted, should result either in resource recovery or minimizing disturbance to significant resources, thereby assuring that cumulative impacts from new pipelines are reduced as much as possible. In addition, these pipeline projects could have a beneficial effect on cultural and paleontological resources by promoting the recovery of information that might otherwise have been difficult to obtain.

5.11 TERRESTRIAL AND AQUATIC BIOLOGY

Construction activities associated with the proposed pipeline, in conjunction with the construction of the other projects on the cumulative list, could result in cumulative impacts to vegetation and wildlife in the eight-county area. Many of the sensitive species discussed in this EIR/EIS have limited ranges and habitats, and any regional development could permanently reduce a species' survivability, even if these adverse effects involve only temporary land disturbance. Even though much of the natural environment of western Kern County has been altered by oil field and industrial activities, the environment provides habitat for such special status wildlife and plant species as the blunt-nosed leopard lizard, the San Joaquin antelope squirrel, the giant kangaroo rat, the San Joaquin kit fox, the Le Conte's thrasher, the valley upland saltbush, and the Kern mallow. The Section 7 and California Endangered Species Act consultation processes provide mechanisms for evaluating and controlling impacts to listed species.

For example, in Stanislaus County, the interactions between the construction of the San Joaquin Valley Pipeline and the Stanislaus County Waste-to-Energy Project could threaten existing habitat of the San Joaquin kit fox. Since any kind of development has this additive effect, only consistently applied mitigation plans can minimize the threat to rare, threatened, and endangered plants and wildlife species in the San Joaquin Valley.

5.12 SAFETY AND OIL SPILL CONSIDERATIONS

All of the pipeline projects listed on Table 2-12 have been or will be required to provide system safety, reliability, and/or oil spill contingency plans as part of their application and permitting processes. Such plans reduce the likelihood of, and impact from, fires, explosions, and oil spills, but do not eliminate these possibilities. Once completed, each of these projects would add to the overall possibility of a fire, explosion, or oil spill in Kern County. It is highly unlikely, barring an earthquake of unexpected magnitude in this area, that two or more such accidents would occur simultaneously; rather, cumulative impacts would mean a greater chance of a given accident occurring in one out of all of the pipeline systems. Such an oil spill, fire, or explosion could endanger public safety and would adversely affect soils, surface water, terrestrial and aquatic biology, and possibly groundwater, as explained in Section 4.

6. MITIGATION MEASURES

This section describes the mitigation measures which will be implemented to reduce and/or avoid environmental impacts. All measures have been numbered consecutively for cross-reference purposes with the summary at the beginning of this report. The mitigation measures are described by environmental feature. Two kinds of measures are distinguished under each environmental feature:

- o Proposed project description; and
- o Other mitigation measures.

The project description measures are those measures which have been integrated into the proposed project and which constitute a part of the formal application to SLC and BLM. These measures were factored into the impact assessment, and implementation of the project without these measures would result in impacts which are substantially more significant than those described in Section 4.

Other mitigation measures are those which are required in addition to the project description measures proposed as part of the project; these measures are necessary to mitigate significant impacts and potentially significant impacts described in Section 4.

BLM, SLC, and all other agencies having permitting authority over the particular features which prompted the mitigation requirements may require the other proposed mitigation measures to be incorporated into the project's permits.

6.1 MITIGATION OF CONSTRUCTION IMPACTS

6.1.1 Geology and Geological Hazards

Project Description Measures

[1] Geotechnical studies of fault crossings, landslide-prone areas, and area of potentially erodible materials at drainage crossings were performed by Woodward-Clyde Consultants in 1985 and 1986.

- o Effectiveness: These studies were essential for sound engineering and environmental routing of the pipeline and identification of hazard locations requiring further mitigation.

[2] When blasting is required, the construction contractors will follow these procedures:

a. Blanketing of blasting (mats) will be used if structures or other utilities are located within 75 feet of the area to be blasted. No blasting will be conducted within 0.25 miles of I-5, the California Aqueduct, or other major canals.

b. Special care will be taken to avoid damage to underground utilities or underground watercourses or springs. Blasting will generally be avoided in these areas, unless no alternative to blasting exists.

c. Landowners or tenants that may be affected will be notified at least 48 hours in advance so that adequate steps can be taken to protect livestock or other property.

d. Any loose rock scattered by the blast will be collected and disposed of in the manner specified by the landowner.

e. All necessary permits will be obtained prior to conducting any blasting work. All work will be performed in compliance with state and/or local codes or ordinances.

f. All work will comply with safety procedures prescribed by the explosives manufacturer as well as accepted practices in the industry, including ANSI A10.7, Safety Requirements for Use of Explosives in the Construction Industry, and ANSI/NFPA 495, Code for Manufacturing, Storage and Use of Explosive Materials.

- o Effectiveness: These measures will insure that vibration and noise impacts and nuisance effects are mitigated, and worker safety is improved. Blasting will not have a significant residual impact.

[3] The pipe will be weighted to eliminate instability in water-saturated zones.

- o Effectiveness: This measure will be generally effective to reduce buoyancy.

Other Mitigation Measures

[4] As identified by geotechnical studies of the route, the major concern with respect to seismic hazards is with the crossing of the Concord Fault under the Pacheco Creek. Because this active fault is so close to the refinery at Martinez, the proposed terminus of the pipeline, it is essentially unavoidable by any alternate route. A

geologist will examine the pipeline trench for evidence of faulting during the centerline survey and during construction in this vicinity.

To mitigate potential damage to the pipeline and to minimize impacts in the event of a break or spill, the design of the pipeline will provide for lateral displacement of up to 3 feet, the maximum expected along this fault. Various engineering approaches will be evaluated; for example, an overhead crossing; or a wide, shallow, loosely backfilled trench; or a tube-in-tube bored undercrossing. Each of these approaches requires the use of flexible, high-tensile-strength steel pipe. Depending upon the angle at which the fault is crossed, provisions for extension or compression of the pipeline will be made. Oil spill containment equipment identified in the Oil Spill Contingency Plan will be stored near the fault at the refinery. See also measure [63].

- o <u>Effectiveness:</u> These engineering measures will reduce the probability of rupture in the event of a tremor or earth movement.

[5] The 80,000-barrel storage tank at Mid station could be subject to intense ground shaking and the high water table could lead to liquefaction during an earthquake. The tank will be built, following a soil mechanics study of the site, on a specially designed foundation, if necessary, and/or the tank will be compartmentalized to avoid sloshing of the contents, which damaged tanks during the Coalinga earthquake. The tank must be built to withstand an earthquake of at least MMI VIII.

- o <u>Effectiveness:</u> Proper design of this particular storage tank will significantly diminish the risk of a major oil spill due to a major seismic event (MMI VIII).

[6] Rock will not be blasted if it can be pre-ripped with a bulldozer prior to excavation with a backhoe or wheel excavator.

- o <u>Effectiveness:</u> Pre-ripping will further reduce the need for blasting hard rock, which is not extensive along the proposed route. In conjunction with measure [2], blasting will not have a significant impact.

[7] The manually operated block valves at Pacheco Creek, which overlies a trace of the Concord Fault, will be automated to reduce shutoff time.

- o <u>Effectiveness:</u> This measure will reduce the size of a spill by the amount that would spill between the time of detection and manual shutoff of the block valves at this environmentally sensitive location. A spill would still be significant.

6.1.2 <u>Soils</u>

<u>Project Description Measures</u>

[8] A Soil Conservation Plan will be developed by the applicant prior to construction. Reclamation and erosion control measures will

be implemented to mitigate potential impacts on soils resulting from pipeline construction, operation, accidents, and abandonment. The mitigation measures will be site- and soil-specific, so that soils which occupy steep slopes, are highly susceptible to erosion, and/or which lack suitable topsoil will receive particular attention. For the design and implementation of reclamation measures, steep slopes will be considered to be those with a greater than 3:1 slope.

Depending on degree of slope, type of soil, and other site factors, methods such as use of excelsior or straw mulch with plastic netting, hydromulching or hydroseeding, and construction of terraces may be required to control erosion and improve vegetation establishment in these areas. Other measures to stabilize disturbed soil material, reduce soil loss due to erosion, revegetate the right-of-way and ancillary facility sites, and restore soil productivity are:

a. Segregation of topsoil ("A" horizon) during trenching to salvage and replace topsoil where necessary to comply with regulations and landowners' requirements.

b. Construction or placement of erosion control features to limit steepness and length of slope (e.g., water bars, collection ditches, terraces, riprap, or sand bags or straw bales for temporary control).

c. Seedbed preparation of the right-of-way and disturbed areas including, if necessary, surface roughening and tilling across slope.

d. Application of seed mixtures (adapted grass or other plant species) which have been approved by the resource management agencies and/or landowner.

e. Addition of soil amendments, such as fertilizer, if necessary, and the use of appropriate seeding methods (e.g., drill seeding and broadcast seeding) to enhance the degree of germination and rooting.

f. Mulching with hay, straw, or wood fibers, if necessary to protect the soil surface.

g. Crimping of mulch on the contour into the soil or tacking netting over an organic mulch to hold the mulch, soil, and soil mixture.

h. Monitoring of disturbed areas by the applicant to identify potential soil instability or eroded areas and to implement the required revegetation measures to restabilize the soils.

o <u>Effectiveness</u>: If applied during the time of the year when germination and revegetation are possible, the project soil conservation plan will mitigate construction impacts on most soil types and sites. The monitoring will ensure that special remedial actions will be implemented if problems are identified. Residual impacts will be insignificant on all but the steepest slopes (i.e., >18%) in Contra Costa County.

Other Mitigation Measures

Project description measures identified under [8] above are appropriate, given the commitment made to site-specific soil conservation and revegetation criteria. Certain additional measures which need to be included are described below. None of the measures will be effective in and of themselves, but require implementation on an as-needed basis according to a site-specific conservation plan. Even under natural conditions, the ground vegetation cover (percent coverage) will be incomplete and the erosion hazard high where bare soil is exposed.

[9] Construction of segments of the pipeline through landslide-prone areas as identified on Table 4-2 will be accomplished when the soils are dry to minimize the likelihood of triggering renewed sliding. The pipeline will be placed at a depth greater than the maximum depth of geologically recent sliding at all locations where such sliding is observed during the centerline survey.

- o Effectiveness: These measures will prevent impacts from landslides and ensure burial of the pipeline below any unstable overburden.

[10] On steep slopes the trench will be filled with unconsolidated material that will dessicate due to heat and extreme permeability, will resist revegetation, and will wash out selectively, thus degrading the right-of-way and the surrounding environment at a fast rate. The soil conservation plan will require that revegetation efforts be continued on these steep slopes until vegetation is successfully reestablished. Permanent measures may also be required (see measure [14] below). From among the sites identified in Table 4-3 in Section 4.2.3 as difficult to revegetate, it is assumed that a residual impact will remain significant on all slopes of 18% or more (see Table 6-1).

- o Effectiveness: Although this will substantially reduce impacts, the impact will remain significant on steep slopes.

[11] Temporary soil erosion controls will be implemented until revegetation measures are applied during the proper seasonal period.

The potential for water erosion is greatest from November through April. Although disturbed areas of the route will have little potential for erosion from late spring to mid-fall, adequate measures for control of runoff should be in place before the winter rains begin and prior to beginning revegetation. In many areas, successful revegetation will be contingent upon the adequacy of the erosion control measures implemented and these will be continued until success is assured.

The SCS has developed standards and specifications for temporary and permanent erosion/sedimentation control, specifically for those regions of California crossed by the pipeline. Temporary soil erosion control structures are designed to temporarily control runoff until disturbed areas have become stabilized. Various temporary structures,

Table 6-1

STEEP SLOPING SITES ALONG THE PROPOSED ROUTE BY COUNTY

County	Mileposts	Number of Slopes* >12%	Number of Slopes* >18%
Kern	6.5 - 6.8	--	1
	11.4 - 12	1	--
Kings	64.5 - 71	34	--
Fresno	92 - 96.5	10	--
	108.8 - 111.5	8	--
	134 - 138.8	8	2
Merced	138.8 - 139	1	--
	140.5 - 146.2	5	1
	150.5 - 155.5	5	2
	156.5 - 157	1	--
Stanislaus	177.5 - 179.5	4	--
	185.5 - 194.5	18	--
Alameda	218 - 221	6	--
	223 - 224.3	4	--
Contra Costa	224.3 - 226	6	--
	230 - 235	4	--
	240 - 254	5	59

*Estimate based on USGS topographical maps (1:24,000).

such as diversion dikes, interceptor dikes, perimeter dikes, straw bail dikes, interceptor swales, stone outlet structures, sediment basins, and sediment traps, are proven effective measures when correctly implemented and maintained. They will be implemented where and when necessary as indicated in the soil conservation plan.

Seeding of rangeland areas can only be successful in late fall to early winter; October and November are the optimal months.

- o Effectiveness: Revegetation success is enhanced by seeding during October and November, and by implementing soil erosion controls (temporary or permanent) in advance of winter rains and prior to revegetation.

[12] Specialized recommendations for seed mixtures and seedbed preparation, which have been developed and tested by the SCS, will be incorporated in the right-of-way revegetation procedures. Grasses and seed mix applications recommended for rangeland revegetation in Kern, Kings, and Fresno counties are listed in Table 6-2. Seeding recommendations for Merced, Stanislaus, San Joaquin, Alameda, and Contra Costa counties are given in Table 6-3. Generally, it is recommended that 2,000 pounds of straw mulch be applied per acre to newly seeded rangeland/grassland areas. Ammonium sulfate fertilizer should also be applied, at 500 pounds per acre. Native grass mixtures which do not impact existing communities will be specified when required and where necessary to avoid impacts.

- o Effectiveness: Site-specific recommendations for right-of-way revegetation will have the highest degree of success. The residual impact will be negligible when the right-of-way is returned to its original condition and properly revegetated.

[13] Saline rangeland and pasture soils encountered by the route in areas of high water table will be revegetated with an adapted species, such as salt grass (Disticlis spicata). Dry saline-alkali soils can be seeded with any of the grasses listed in Tables 6-2 and 6-3, with red brome being the most salt-tolerant.

Desert saltbush (Atriplex polycarpa) and California buckwheat (Erigonum fasciculatum) are commercially available for restoring shrub areas and are deemed to be of value as wildlife habitat. These plants have been found by the SCS to be hardy and very suitable species for restoring disturbed shrub areas.

Saline soil materials will be returned to the trench first and covered with topsoil to supply an appropriate substrate for the planting material.

- o Effectiveness: Saline soils will be difficult to revegetate, but can be successfully restored by conserving top soil and by using adapted native vegetation. The residual impact will not be significant.

[14] Severely destabilized areas will require long-term protection. Permanent drainage and erosion control structures will be in-

Table 6-2

GRASS SEEDING REQUIREMENTS FOR RANGELAND IN KERN, KINGS, AND FRESNO COUNTIES*

Drilled seeding requirements (per acre)

- o 2 lbs. Zorro Annual Fescue (*Festuca megalura var. Zorro*)
  8 lbs. Panoche Red Brome (*Bromus rubens var. Panoche*)

or

- o 6 lbs. Zorro Annual Fescue Brome

or

- o 12 lbs. Panoche Red Brome

Broadcast seeding requirements (per acre)

- o 4 lbs. Zorro Annual Fescue
  12 lbs. Panoche Red Brome

or

- o 12 lbs. Zorro Annual Fescue

or

- o 18 lbs. Panoche Red Brome

*Any one of the above six options is an acceptable application per acre.

Source: USDA SCS, Fresno, California, Area Office, 1986.

Table 6-3

GRASS SEEDING REQUIREMENTS FOR RANGELAND IN MERCED, STANISLAUS, SAN JOAQUIN, ALAMEDA, AND CONTRA COSTA COUNTIES*

Drilled seeding requirements (per acre)

- o 8 lbs. Blando Brome (*Bromus mollis*)
  2 lbs. Zorro Annual Fescue (*Festuca megalura*)

  or

- o 12 lbs. Blando Brome

  or

- o 6 lbs. Zorro Annual Fescue

Broadcast seeding requirements (per acre)

- o 12 lbs. Blando Brome
  4 lbs. Zorro Annual Fescue

  or

- o 18 lbs. Blando Brome

  or

- o 12 lbs. Zorro Annual Fescue

*Any one of the above six options is an acceptable application per acre.

Source: USDA SCS, Fresno, California, Area Office, 1986.

stalled if necessary; examples are water bars, diversions, protected drain outlets, level spreaders, or riprap. The stabilization effort will be continuous until it is effective.

- o <u>Effectiveness</u>: Measures will mitigate erosion-induced soil losses or extremely sensitive, unstable sites by soil conservation engineering practices. Residual long-term impact will be insignificant.

[15] The soil conservation plan will identify how and when monitoring of disturbed areas will be conducted and will identify monitoring criteria.

- o <u>Effectiveness</u>: The measure will ensure effective monitoring of areas where revegetation will be difficult.

[16] Topsoil segregation from underlying soil materials and return of the topsoil to the surface of the trench area will be practiced during construction of the entire route. Exceptions based on specific, unusual, or prohibitive conditions will be identified in the soil conversation plan. The shallow layer of topsoil, which may be 10 inches or less for certain soils, and the presence of saline subsoils which can contaminate the topsoil require that the depth of topsoiling be specified in the soil conservation plan. The plan will define the depth of topsoil to be conserved, taking into account the desireability of preserving root stock in areas covered by native vegetation.

- o <u>Effectiveness</u>: This measure will reduce or eliminate revegetation problems caused by changes in soil chemistry or characteristics by preventing mixing of soil materials. Topsoil conservation could reduce the requirement for purchasing seed or native planting material. No residual impact.

[17] Compaction of soils can adversely affect productivity due to reduced permeability, decreased water uptake, ponding runoff in flat areas, increased runoff, erosion, and sedimentation. Agricultural soils compacted by vehicles and heavy equipment during construction will need to be loosened by discing or harrowing during restoration to restore good soil surface characteristics.

- o <u>Effectiveness</u>: Soil compaction on the right-of-way will be corrected to a degree that is not detrimental to normal agricultural production. Residual impacts are not expected to be significant.

6.1.3 Surface Water

Project Description Measures

[18] Construction contractors will minimize the time of disturbance and the area disturbed in streams and will stabilize disturbed areas promptly.

- o <u>Effectiveness</u>: This measure will reduce stream-side erosion and siltation and sedimentation.

[19] The stipulations of the landowners and all applicable federal, state, or local regulatory requirements concerning water quality standards and the discharge of hydrostatic test water will be followed. Prior to release, specific tests of hydrostatic test water will be conducted and the test water will be treated, if necessary. Since no cleaning fluids are planned to be used, no significant levels of contaminants will be present in the released water other than minor amounts of oil and grease, rust, or other metals, because the water used in hydrostatic testing will be in contact with new pipe.

- o <u>Effectiveness</u>: Testing, and treatment if necessary, will ensure the safe release of hydrostatic test water without any impact on stream water quality.

[20] Test water will be released in a controlled manner to avoid scour upon discharge into natural waterways. Test water will be released using the following techniques to control flow: (a) use of a valve at the discharge point on the pipeline segment; (b) no vertical drop (cascading); (c) discharge to rocky areas to reduce sedimentation and turbidity; (d) discharge to the middle of stream channels and not stream slopes; and (e) discharge into a low gradient section of the receiving stream.

- o <u>Effectiveness</u>: The controlled release of hydrostatic test water will prevent stream scour and turbidity. No significant residual impact.

[21] For flowing streams, including Pacheco Creek, conventional backhoe-type equipment or a dragline that operates from the bank will be used to open the trench across the stream bottom. During excavation, flow will be maintained at all water crossings. The pipeline will be placed below scour depth and, at a minimum, the trench will be sufficiently deep to allow 5 feet of cover below the natural channel bottom, depending on permit specifications and design considerations. Excavated material will be stockpiled on the bank above the ordinary high water mark. The pipe will be weighted to eliminate instability in water-saturated zones. This will be particularly required in all Flood Zone A areas. After pipe installation, the trench will be backfilled with originally excavated material or as specified by applicable permits. The banks will be backfilled, stabilized, and restored. Stabilization and restoration of the banks of intermittent streams will be accomplished by grading to original contour and revegetation. The stream banks will be restored to original contours and stabilized with soil or concrete-filled sacks, riprap, or vegetation to reduce erosion.

Weighting of the pipe by casing in concrete is necessary in the following areas: marsh deposits east of the Martinez refinery, along approximately 2 miles of pipeline, and floodplains of Pacheco, Corral Hollow, Los Gatos, Panoche, Orestimba, Salado, Del Puerto, Salt, Chico, Martinez, and Santos creeks (see Table 4-4).

- o Effectiveness: These specifications incorporate good construction practices which ensure pipeline stability and which will help to mitigate potential impacts on natural streams and aquatic communities by maintaining the water flow and protecting the banks. No significant residual impacts.

[22] Fueling and lubrication of construction equipment will occur away from aquatic habitats, at least one-eighth mile from Pacheco Creek, other flowing streams, canals, aqueducts, and riparian habitats. Any spills will be cleaned up.

- o Effectiveness: This measure will prevent construction-related spills from impacting water resources. No residual impact.

Other Mitigation Measures

[23] For flowing streams, temporary erosion and sedimentation control measures will be used to minimize potential impacts to surface water during construction. Such measures must be in place prior to the start of construction in the affected streams. They include placement of filtration barriers along stream banks; construction of siltation barriers to reduce surface runoff velocities on steep grades; installation of flume pipes or temporary bridges at shallow streams that will be crossed repeatedly by construction machinery; and post-construction restoration of stream banks, staging areas, and rights-of-way as soon as possible after construction. Hay bales and silt curtains across the affected stream(s) will be used to further limit downstream sedimentation and turbidity. From September through May, these measures will be implemented at all stream crossings (Table 3-13) regardless of whether they are flowing or not, to ensure that precautions are in place in the event unanticipated rains contribute to stream flow.

- o Effectiveness: These measures will serve to trap silts, prevent entry of soils from the banks into the streams, and retard the siltation process so that increased sedimentation and turbidity are less noticeable in the downstream portions of the affected streams. They also provide for the overall protection of all streams against excessive sedimentation regardless of variable stream flows. They are necessary because the project traverses numerous, usually dry streams which would be affected by a single precipitation event and which would collectively contribute to siltation of the adjacent valley's irrigation water systems and fields. Residual sedimentation and turbidity impacts are not significant because they will approach natural levels.

[24] The discharge of waters from trench dewatering, if necessary, will be conducted in such a manner as to minimize erosion and sedimentation problems. The discharge rate will be controlled and the discharge filtered, diverted to settling ponds to remove solids prior to release to an adjacent surface water body, or allowed to percolate into the ground. Should the water be released directly onto the ground, deflectors will be used to disperse it. The discharge and disposal of the effluent will be conducted in compliance with

applicable regulatory requirements and good pipeline construction practices.

- o Effectiveness: Trench dewatering, if necessary, will not have a significant residual impact on water quality.

6.1.4 Groundwater

Project Description Measures

None.

Other Mitigation Measures

None necessary.

6.1.5 Air Quality

Project Description Measures

[25] All activities associated with the project will be conducted in a manner that will avoid or minimize potential degradation of air quality. Construction, operation, maintenance, and abandonment activities will be conducted in accordance with applicable air quality standards, including, but not limited to, standards adopted pursuant to the Clean Air Act, as amended (42 USC 7401, *et. seq.*).

- o Effectiveness: Air impacts will not exceed acceptable standards and permitted emissions.

[26] Construction emissions will be mitigated through proper maintenance of construction equipment, by maintenance of manufacturer-installed exhaust systems for construction equipment, and by watering the construction zone to control fugitive dust emissions.

- o Effectiveness: Localized construction impacts on air quality near the construction zone will be mitigated by these measures. No significant residual impact.

[27] Construction activities will be curtailed during second-stage smog alert.

- o Effectiveness: On high oxidant days, this measure will provide a minor reduction in precursor emissions.

Other Mitigation Measures

None necessary.

6.1.6 Socioeconomics and Transportation

Project Description Measures

[28] None, other than routine measures which ensure effective scheduling and implementation, including limitations on the size of

the construction work force, 50% use of local workers, and various measures required to maintain near-normal traffic flows, such as:

a. Adequate warning signs will be positioned sufficiently far in advance of construction zones so that vehicle drivers will have sufficient warning. Signs will be positioned in accordance with relevant regulations. Warning signs, barriers, flagpersons, and other techniques will be used, as appropriate.

b. Detour routes will be established using the nearest available secondary access routes.

c. Temporary detours will be constructed around the construction zone where secondary access roads do not exist.

d. An estimated 60% of the workers will be bussed to the construction site.

- <u>Effectiveness</u>: These measures are necessary to prevent traffic jams and accidents. The residual impacts on transportation are not significant.

<u>Other Mitigation Measures</u>

[29] In the area near the northern terminus of the route where children may be attracted and exposed to construction hazards, leaflets will be distributed to all houses in the neighborhood explaining the nature and duration of construction and advising parents that children will not be permitted in the construction area. In addition, a security guard will be on-site during daylight hours to prevent unauthorized access, and the open trench will be fenced at night.

- <u>Effectiveness</u>: No significant residual impact; no unusual risks of accidents to the public, particularly children.

6.1.7 <u>Noise</u>

<u>Project Description Measures</u>

[30] Potential noise impacts are primarily related to the number of people exposed to the noise and the perceived nuisance associated with the noise. Typically, the greatest nuisance is perceived during nighttime hours. Construction activities will be conducted daily from 7:00 a.m. to 6:00 p.m. In addition, proper construction equipment operating techniques will be implemented and manufacturer-installed noise abatement equipment will be maintained to reduce noise levels to the greatest possible extent during construction activities.

- <u>Effectiveness:</u> This measure will mitigate noise impacts during the nighttime when people's perception of the impact would be greatest.

Other Mitigation Measures

[31] There will be no weekend construction in sensitive residential and recreation areas.

- o Effectiveness: This measure avoids/mitigates impacts when most people are at home or using recreational facilities. Table 4-13, in Section 4.2.8, lists noise-sensitive areas for the project.

6.1.8 Land Use and Recreation

Project Description Measures

[32] In areas where the pipeline crosses agricultural land use (primarily in the San Joaquin Valley), the following measures will be implemented:

a. Small-scale route variations to avoid sensitive agriculture fields, if practicable.

b. Small-scale construction scheduling to avoid sensitive time periods during agricultural practices, if practicable.

c. Limiting of trenching to depths above drainage tiles, if practicable.

d. Restoration of disturbed fields to pre-construction conditions or conditions acceptable to landowners. Specific measures may include drainage tile, ditch, and pipe replacement and reestablishment of required grade for drainage.

- o Effectiveness: These measures will mitigate impacts on crop production and reduce inconvenience to farmers.

[33] The project construction work force will not use public facilities, such as campgrounds, for temporary housing.

- o Effectiveness: This measure will avoid impacts on tourism and recreation, and on public park maintenance budgets. Residual impact is not significant and is limited to the use of recreational facilities by the labor force only for recreational purposes--a minor contribution to visitors/day.

[34] Public monuments and markers on public lands within the right-of-way will not be disturbed or removed. If the removal of monuments or markers is necessary during specific construction activities, the appropriate agency will be advised. Removal and/or relocation will then be completed according to the detailed instructions of the appropriate agency.

- o Effectiveness: No significant residual impact on public markers and monuments.

[35] After construction, the area will be cleaned up and restored. All surplus materials will be removed, and the land will be

restored to landowner specifications. Solid wastes will be disposed of in an approved landfill or according to landowner instructions.

- o Effectiveness: This measure will reduce the visual impacts of construction and be responsive to landowner instructions.

Other Mitigation Measures

[36] The length of open trench during construction will be limited as much as possible and livestock crossovers will be provided, if necessary. Open trench will be fenced off where necessary.

- o Effectiveness: These measures will mitigate impacts on crop production and reduce inconvenience to farmers.

[37] Potential land use conflicts, identified in Tables 4-15 and 4-16, will be resolved by fine-tuning of the final alignment in coordination with local planning agencies and regional authorities and state and federal agencies, particularly in relation to BLM lands, Bureau of Reclamation lands, and Contra Costa County's Black Diamond Regional Preserve, landfill proposals, and residential development proposals (see Table 4-15 for complete listing).

- o Effectiveness: Significant land use impacts will be avoided by coordinated planning and fine-tuning of the final route alignment in these areas. The local land use planning process will resolve conflicts before issuing permits; hence, no residual impacts will remain when the permits are issued.

6.1.9 Visual Resources

Project Description Measures

[38] Mitigation measures will be implemented to reduce or minimize visual contrasts for the pipeline right-of-way, booster stations, and ancillary facilities. There are three generic types of mitigation techniques: (a) strategic location, (b) minimization of disturbance, and (c) repetition of the basic landscape elements (form, line, color, texture). The visual resources mitigation plan for the project includes the following measures:

a. During construction, clearing of land for facilities will be completed to create curvilinear ("feathered") boundaries instead of straight lines and to minimize disturbance of the landscape to the greatest practicable extent. Grading will be conducted in a manner that will minimize erosion and conform to the natural topography.

b. Soils and rocks that are excavated during construction and not used will be evenly backfilled into the cleared area or removed from the site. Soil and rocks will be graded to conform with the terrain and the adjacent land.

c. The colors selected for structures will be uniform and noncontrasting to blend in with the immediate natural environment. Building structures associated with new booster stations will be painted desert tan.

d. Electric transmission line poles will be placed strategically to the greatest practicable extent to make maximum use of existing topography and vegetation for screening.

e. Wood transmission line poles will be utilized to reduce visual contrasts with the natural surroundings. Conductor material will be carefully selected to avoid sheen or a strong silhouette and to provide visual blending of the conductors into any given setting through which the line must pass.

o <u>Effectiveness</u>: The implementation of these mitigation procedures will effectively reduce potential visual contrasts of project facilities.

<u>Other Mitigation Measures</u>

[39] Siting requirements and visual impacts for booster station SJV-2b and microwave tower No. 8, and for booster station SJV-3b and microwave tower No. 11, will be carefully reviewed in relation to SJV-4, which has a better location in regard to visual resources. SJV-2b would be better sited near Little Panoche Road to place the station and microwave tower No. 8 in the background. SJV-3b and microwave tower No. 11 are located near the Westley Rest Stop-Park, which is the most widely used rest stop in the region; consideration will be given to relocating SJV-3b and its microwave tower. SJV-4 has only a moderately significant impact. If relocation is not feasible, a site-specific landscaping plan will be prepared for SJV-2b and SJV-3b to provide screening and/or blend the stations with their surroundings.

o <u>Effectiveness</u>: The residual impact will be reduced but will remain significant.

[40] All cleared areas of the pipeline right-of-way and building or microwave tower areas will be revegetated immediately after completion of construction according to a soil conservation plan (see mitigation measure [9]). Grasses that are similar to the adjacent vegetation cover will be used where possible to ensure that the created visual pathway will blend as much as possible into the surrounding landscape.

o <u>Effectiveness</u>: The residual impact of the visual intrusion will be insignificant for the right-of-way.

[41] Oaks, cottonwoods, and other large trees will not be removed if this can be avoided by minor realignment. If trees must be removed, similar tree types will be planted in place, except on the 30-foot right-of-way, which will remain clear of woody growth for the life of the project. Minor deviations of the right-of-way will avoid large visually important trees, such as oaks, and tree clusters. The soil within the root zone of these trees will not be disturbed.

- o Effectiveness: Replanting with native oaks has not been very effective in the past in California. Thus, avoidance of oak trees is the most effective means of mitigation.

6.1.10 Paleontology

Project Description Measures

[42] A pre-construction field survey of paleontological resources was conducted to identify sensitive areas more precisely.

- o Effectiveness: Improved resolution of resource distribution will reduce potential impacts and the need for other monitoring and possibly salvage during construction.

[43] Controlled scientific removal of fossils that would otherwise be damaged or destroyed during construction may be necessary and will be performed by professional paleontologists authorized by the appropriate federal, state, and local collecting permits. In accordance with these permits, all fossils will be placed in appropriate repositories, with records of their precise locality and descriptions of the geological and faunal context of each.

Sensitive areas will be monitored during construction. Procedures established and approved by permitting agencies for temporarily halting or redirecting construction if fossil accumulations are encountered during construction will be followed. An approved paleontologist will be notified immediately upon encountering a fossil discovery so that the significance of the discovery can be evaluated efficiently and, if necessary, mitigation actions implemented.

- o Effectiveness: These measures will reduce impacts on paleontologic resources.

Other Mitigation Measures

[44] Direct construction impacts to paleontological resources will be mitigated by the following procedures:

a. Monitoring of ditching within areas assessed to have high or very high paleontologic impact significance as shown on Table 4-23 will be done by an approved vertebrate paleontologist.

b. Any vertebrate fossils discovered during project construction, by personnel involved in construction or other project activities, within unmonitored areas, will be reported immediately to the approved paleontologist for assessment of value and recommended mitigation.

c. The approved paleontologist will be empowered to halt temporarily or redirect project construction in the event that (1) unforeseen concentrations of vertebrate fossils assessed to have unusually high importance (as judged by the criteria in Appendix F) are revealed, and (2) such interruption will avoid further damage to the specimens. Sufficient time will be allowed for consultation with the authorizing agencies regarding mitigation.

- o <u>Effectiveness</u>: These measures will minimize loss of the scientific value of paleontological resources and improve knowledge of their distribution.

[45] Indirect impacts due to unauthorized collection will be minimized by imposing confidentiality regarding the existence or location of fossil localities.

- o <u>Effectiveness</u>: This measure will reduce the potential for irretrievable losses in case significant paleontological resources are identified.

6.1.11 Cultural Resources

Project Description Measures

[46] Impacts to cultural resources will be mitigated by development and implementation of a cultural resources management plan, in consultation with the California State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation (ACHP), and the authorizing agencies. The plan will outline procedures and methods to identify, evaluate, avoid, or salvage cultural resources within the project area. The plan includes the following components:

a. A cultural resource survey, which was conducted prior to construction.

b. Evaluation of identified resources for eligibility for nomination to the NRHP. Potential impacts on eligible cultural resources will be evaluated as set forth in 36 CFR 800.3.

c. If significant adverse effects to NRHP-eligible properties occur as a result of the proposed project, mitigation measures to reduce or eliminate these adverse effects will be implemented. This will be accomplished through minor deviations in the alignment, by preservation <u>in situ</u>, or by preconstruction scientific data recovery and report preparation. Scientific data recovery and report preparation is accomplished through archaeological excavation, further archival research, and, in the case of standing structures, documentation according to Historic American Building Survey (HABS) standards.

d. A construction monitoring program may be required in areas where the cultural resources inventory indicates that resources not now evident on the ground surface are likely to occur as buried resources.

e. A Memorandum of Agreement has been developed between the ACHP, BLM, and the California SHPO detailing specific procedures in accordance with 36 CFR 800 that would be followed for any significant cultural resource sites that cannot be avoided.

f. Should a previously unidentified historic cultural property be discovered during the construction of the pipeline the procedures as noted in the Memorandum of Agreement shall be implemented.

o <u>Effectiveness</u>: The above measures will culminate in an effective cultural resources identification and mitigation plan consistent with BLM, ACHP, and California SHPO requirements set forth in the Memorandum of Agreement.

[47] Prior to data recovery, a treatment plan will be prepared for review and approval by the SHPO, ACHP, and the authorizing agencies prior to implementation.

<u>Effectiveness</u>: This measure will ensure adequate data recovery.

[48] Sufficient information was obtained at the time of survey to determine whether sites are potentially eligible for inclusion on the NRHP. Criteria for determining NRHP eligibility are found in 36 CFR 60.4. Limited testing of subsurface deposits may be needed for the single site identified during the field identification program. The report documenting results of the field identification program and evaluating significance has not been reviewed and accepted by the appropriate agencies. For this reason, it is premature to identify specific mitigation measures that will be applied to the identified cultural resources. However, the Memorandum of Agreement requires adequate treatment of sites evaluated to be significant (i.e., eligible for listing on the NRHP), and provides a process to accomplish this.

o <u>Effectiveness</u>: These actions, under Section 106 of the National Historic Preservation Act, will ensure that the effects of pipeline construction and operation on cultural resources are fully considered, as required by law.

<u>Other Mitigation Measures</u>

[49] If previously undiscovered cultural resources are uncovered during construction, work will stop and a competent archaeologist will be called in to evaluate the site.

o <u>Effectiveness</u>: This measure will reduce impacts in areas of low sensitivity (such as agricultural fields) which will not be surveyed in detail.

[50] Contact will be maintained with appropriate Native American groups to determine the nature and extent of concerns regarding specific cultural resources. Native Americans will be notified prior to implementation of any data recovery programs.

- o Effectiveness: The residual impact will be insignificant on the Native American cultural heritage.

[51] In situations where site boundaries are ambiguous and close to impact areas, an archaeological monitor and a representative of the Native American group claiming concern will be invited to be present as observers. If potentially significant cultural materials or features are encountered, they will be preserved either by realignment of the proposed facilities, or by prompt evaluation and recommendation of any necessary mitigation measures. The areas requiring such monitoring will be based on the results of the identification program in consultation with the authorizing agencies, California SHPO, and ACHP.

- o Effectiveness: This measure will ensure that the proper procedures are carried out to take into account professional and public cultural concerns.

6.1.12 Terrestrial and Aquatic Biology

Revegetation of disturbed areas is discussed in Section 6.1.2; mitigation measures designed to reduce impacts on water resources and aquatic habitat are presented in Section 6.1.3. Mitigation for oil spills is discussed in Section 6.2.12.

Project Description Measures

[52] The following mitigation measures will be implemented in order to reduce potential adverse impacts of project implementation on vegetation and wildlife:

a. When possible, disturbance of habitats that support special status plants, and sensitive and valuable vegetation types such as riparian areas, will be avoided by realignment and/or minor deviations in the route and facility siting.

b. The width of the construction right-of-way will be reduced from 80 to 50 feet in the above sensitive areas crossed by the proposed route.

c. Temporary work spaces and storage areas will not be placed in riparian or other sensitive habitats.

d. Off-road vehicle use by construction workers in the project vicinity will be restricted to the construction right-of-way. Contractors will be required by specifications in their contracts to limit off-road vehicle use to the construction right-of-way.

e. Use of firearms in construction areas will be prohibited to reduce potential illegal hunting activities.

f. A wildlife biologist has surveyed all potential raptor nesting habitats located in the area of the pipeline right-of-way prior to construction. For any active and inactive nests identified within 1,000 feet of the route, protective measures required by the USFWS, BLM, CDFG, and other involved agencies will be implemented.

g. Surveys have been performed to determine the distribution of habitats of federal and state endangered species, including the San Joaquin kit fox and blunt-nosed leopard lizard, in areas of the San Joaquin Valley crossed by the proposed pipeline. In areas of sensitive habitat for these two species that must be crossed, the width of the construction right-of-way will be limited to 50 feet. Near the kit fox dens, small-scale variations in the route will be made and construction activities will be scheduled to minimize the effects on occupied dens.

h. Site-specific revegetation plans (a soil conservation plan) will be developed to promote reestablishment of suitable habitats for the above-mentioned species. The pipeline will be installed in a manner to restore the topsoil and associated seed sources when backfilling (see soils, Section 6.1.2).

i. The spread of noxious weeds will be minimized as appropriate by revegetation with native species and/or other approved local species.

j. Herbicides will not be used during construction of the pipe--line and ancillary facilities.

k. Prior to trench closure, the trench will be inspected to insure that any animals which may have taken shelter in the trench opening have exited the trench.

o Effectiveness: These various measures will reduce impacts on the terrestrial and aquatic ecology.

[53] An environmental information program will be developed by the applicant and distributed to all workers to (1) identify important environmental resources and potential effects on them, (2) identify mitigation measures, and (3) specify the roles of the Applicant and contractor personnel in implementing these mitigation measures.

o Effectiveness: This will promote an understanding of potential impacts and required mitigation for sensitive resources.

[54] Mitigation measures to maintain surface water quality, by fulfilling the conditions of the Stream Alteration Agreements in accordance with CDFG and using good construction and best management practices at crossings involving aquatic features, will benefit the aquatic ecology (see Surface Water, Section 6.1.3).

o Effectiveness: These measures will minimize the impact on water quality, on the physical aquatic habitat conditions, and on the aquatic organisms dependent on this habitat.

Other Mitigation Measures

[55] Mitigation for the long-term loss of habitat (due to facility siting and right-of-way maintenance) will consist either of the improvement of marginal habitat on areas adjacent to the pipeline or the purchase of conservation easements along the corridor in areas that may be under the threat of agricultural conversion and which are currently occupied by listed or candidate species. Exact areas and acreages will be determined in consultation with USFWS, CDFG, SLC, and the applicant.

- o Effectiveness: This measure compensates effectively for any long-term habitat impacts on special status species. It does not mitigate the impact of the loss of trees, if any, unless special provisions were to include this element in the agreements.

[56] Unauthorized vehicle operation on the right-of-way will be prohibited by appropriate signs and gates. Authorized use will be subject to a low speed limit (15 mph). Illegal plant and animal collections will not be permitted as enforced by current laws and appropriate signs.

- o Effectiveness: These measures will reduce the chance of significant impacts (incidental mortality) on rare or relatively rare species.

[57] No construction will occur within one-half mile of an active raptor nest during nesting seasons and no nests will be disturbed. Construction may proceed near inactive nests (see [52 f] above).

- o Effectiveness: This measure will ensure that nesting birds of prey and/or their nesting sites are not disturbed. The residual impact on raptors is not significant.

[58] The site-specific soil conservation plan (see mitigation measure [9]) will specify special revegetation measures for areas covered by native vegetation (see Table 3-30), such as alkali sink and saltbush scrub, using such techniques as preserving root stock and propagation with native plant materials. Rangelands will be revegetated with approved grass mixtures. The plan will identify the depth of topsoil to be segregated and replaced during trenching in order to enhance revegetation success in these areas, particularly in the area over the pipeline.

During construction in alkali scrub areas, right-of-way clearing will be limited to trimming and crushing whenever possible. The right-of-way will be located adjacent to existing disturbed areas (e.g., roads) where possible. These measures will reduce the amount of vegetation removed as well as reduce erosion potential, and will enhance recovery by not disturbing root systems.

- o Effectiveness: This measure will reduce impacts associated with the temporary loss of habitat to an insignificant level in grassland areas. Alkali scrub will resprout after construction and expedite habitat recovery on the right-of-way, thus reducing temporary loss of habitat to an insignificant level. Where oak trees are removed, revegetation will not fully restore habitat to preconstruction conditions. This represents a significant impact. Cattle would need to be excluded from grazing the seedlings. Avoidance of the trees is the most appropriate mitigation measure.

[59] Because the Tipton kangaroo rat inhabits alkali sink habitat, it will be revegetated with characteristic native plants. Specific details, including a schedule for monitoring to assure revegetation success, will be developed in the soil conservation plan.

- o <u>Effectiveness</u>: This measure will reduce impacts on this sensitive species. (See effectiveness of measures 57 and 58 above.

[60] The pipeline alignment will be fine-tuned to avoid potential San Joaquin kit fox dens in the following locations:

Milepost	Proposed Realignment
18.2	70 feet to east
58.3	20 feet to west
67.9	60 feet to east
84.9	50 feet to east
87.8	70 feet to east
89.6	50 feet to west
120.0	70 feet to west
135.8-136.0	70 feet to west
142.2	20 feet to west
178.3	70 feet to east

The construction right-of-way will be reduced to 50 feet in these areas. If these potential den sites cannot be avoided, identified den sites will be monitored immediately prior to construction to determine if they are active. If they are, construction will be delayed in that location until foxes relocate.

- o <u>Effectiveness</u>: This measure will reduce direct mortality impacts on this special status species to insignificant.

[61] The soil conservation plan will provide for restoring the prevailing hydrology and topography at the Pacheco Creek crossing and for revegetation with pickleweed and other salt-tolerant plants characteristic of this habitat.

- o <u>Effectiveness</u>: This measure will reduce impacts on brackish marsh and specifically on the salt marsh harvest mouse, a special status species.

[62] Realignment of the pipeline at mileposts 40.5 to 40.9 about 800 feet to the west to avoid a high quality wetland, and at milepost 227 to avoid a vernal pool.

- o Effectiveness: This measure will eliminate significant impacts on this important habitat.

6.2 MITIGATION OF OPERATION, ACCIDENT, AND ABANDONMENT IMPACTS

6.2.1 Geology and Geologic Hazards

Project Description Measures

[63] The Oil Spill Contingency Plan (see Appendix B) applies to emergencies resulting from geologic hazard events during system operations. (See also Section 4.2.14, which evaluates system safety and reliability.)

- o Effectiveness: Implementation of the plan will reduce the potential impacts associated with geological hazards which may determine the occurrence of a spill, by ensuring containment and cleanup.

Other Mitigation Measures

Automated shutoff valves will be installed at the Concord Fault at Pacheco Creek (see mitigation measure [7]).

[64] On the basis of the data on the maximum probable Modified Mercalli Intensities (MMI) for the proposed pipeline route, the pipeline will be designed to tolerate an MMI of VIII during its lifetime without rupturing.

- o Effectiveness: This measure will prevent damage to the system from surficial seismic events.

6.2.2 Soils

Project Description Measures

None, other than routine maintenance.

Other Mitigation Measures

[65] Right-of-way maintenance will include erosion control and revegetation as described in Section 6.1.2 (measures [9] to [12]), where the vegetative cover is insufficient and erosion is evident.

- o Effectiveness: This measure will reduce significant soil impacts to insignificant during operations.

[66] The right-of-way will be maintained in perpetuity, and mitigation measure [65] will be applied as necessary.

- Effectiveness: This measure will avoid soil impacts during abandonment when the pipeline remains in the ground.

[67] Impacts on soils from an oil spill can be significantly reduced if, following removal of oil and highly contaminated soils, these soils are aerated by disc plowing and/or harrowing to ensure that microbial activity and oxidation degrade residual oils from the soils. Following thorough and standard cleanup procedures, the soils will be stabilized and revegetated as previously described for post-construction.

- Effectiveness: These measures will accelerate recovery of the soils, promote new growth, and reduce the impact from a spill.

6.2.3 Surface Water

Project Description Measures

[68] The pipe will be placed below channel scour depths.

- Effectiveness: This measure will reduce the potential hazard of pipeline exposure during operation. In conjunction with routine maintenance, the residual impact is insignificant.

[69] The pipeline burial depth will be checked periodically at stream and river crossings. At crossings where channel degradation has reduced the burial depth to less than the scour depth, the pipeline will be reburied to the proper depth.

- Effectiveness: In general, this measure will effectively prevent pipeline exposure for any significant length of time, given ground inspection checks at periodic intervals and weekly aerial inspection flights. No significant residual impact will occur from scour.

Other Mitigation Measures

[70] Automatic block valves will be installed at the above-ground crossings of the California Aqueduct at milepost 160 and the Delta Mendota Canal at 164. The Oil Spill Contingency Plan will be updated to provide for containment equipment and personnel at strategic locations downstream. The equipment will include containment booms and sorbent materials.

- Effectiveness: This measure will reduce oil spill impacts by minimizing shutoff and containment time, thus reducing impacts on wildlife and recreation at O'Neill Forebay and on downstream water supplies.

6.2.4 Groundwater

Project Description Measures

None.

Other Mitigation Measures

None necessary.

6.2.5 Air Quality

Project Description Measures

[71] Emission control equipment will be used to control emissions resulting from the operation of pumps and heaters at new and modified booster stations and to meet applicable emissions standards.

- Effectiveness: Operational impacts on air quality will be insignificant.

Other Mitigation Measures

None necessary.

6.2.6 Socioeconomics and Transportation

Project Description Measures

None.

Other Mitigation Measures

None necessary.

6.2.7 Noise

Project Description Measures

[72] Noise generated by pumps and heaters in new or modified booster stations will be reduced by several methods: (a) station sites will be large enough to reduce the amount of noise transmitted off-site; (b) the turbine engines as purchased will be installed with sound-reducing enclosures; (c) buildings at each site will be designed and located to reduce objectionable noise; and (d) trees or shrubbery will be established peripherally to reduce noise levels off-site.

- Effectiveness: These measures will typically attenuate off-site noise levels. Residual impact will depend on the sensitivity of the location (e.g., Station SJV-3b is sited near the Westley Road Rest Stop Park, a sensitive land use area; however, it is not noise-sensitive near I-5).

Other Mitigation Measures

None.

6.2.8 Land Use and Recreation

Project Description Measures

[73] Gates or other types of barriers will be placed and maintained at locations where the pipeline right-of-way crosses existing

major roads to prevent motor vehicle access to the pipeline right-of-way.

- Effectiveness: Unauthorized use of the right-of-way will not have a significant impact.

Other Mitigation Measures

[74] After construction has been completed, motorized vehicle access to public lands crossed by the right-of-way will be prevented as described above under [73].

- Effectiveness: This measure will enhance revegetation efforts and will limit the proliferation of spur roads in sensitive resource areas.

6.2.9 Visual Resources

Project Description Measures

None.

Other Mitigation Measures

[75] Upon abandonment, all physical above-ground facilities will be removed. Planted trees and shrubbery will be left at the discretion of future landowner(s).

- Effectiveness: This measure will limit long-term impacts on visual resources to the operational phase. No significant residual impact on visual resources will occur.

6.2.10 Paleontology

Project Description Measures

None.

Other Mitigation Measures

[76] Unauthorized use of the right-of-way and the collection of fossils by unauthorized collectors will be discouraged by gates; the confidentiality of fossil locations will be maintained (see measure [73]).

- Effectiveness: These measures will reduce unauthorized access and collection to a level that may approximate the present condition. The residual impact to paleontology is insignificant given the present general accessibility of the region.

6.2.11 Cultural Resources

Project Description Measures

None.

Other Mitigation Measures

None necessary.

6.2.12 Terrestrial and Aquatic Biology

Project Description Measures

None.

Other Mitigation Measures

[77] At the booster stations, vegetation control will be by mechanical methods. A fire break maintained by disc plowing will be more effective than herbicides, which leave dried, dead vegetation in the field. It also reduces the risk of exposure of people and wildlife to herbicides and prevents contamination from the long-term application of herbicides.

- o Effectiveness: The effectiveness of a fire break on potential weed fires is discussed under Section 6.2.13, measure [85].

[78] In the event of extensive maintenance or repair work or a spill in or near special status species habitat shown on Table 4-26, the USFWS and CDFG will be notified so that they can identify any special requirements.

- o Effectiveness: This measure will assist in the development of appropriate mitigation to reduce possible spill impacts to special status species but does not eliminate the potential for incidental mortality in advance of extensive pipeline right-of-way maintenance.

[79] The Oil Spill Contingency Plan will be updated to include specific measures to provide for quick response to spills in or near special status species habitat. The goal will be response and initial containment within 4 hours of identification of a spill by the Anaheim spill center. The Oil Spill Contingency Plan will require that the USFWS and CDFG be notified immediately of spills in or near endangered species habitats to afford the opportunity for consultation.

- o Effectiveness: Although this measure will minimize significant impacts on sensitive habitats, the impact of an oil spill will remain significant.

6.2.13 System Safety and Reliability

Project Description Measures

[80] Specific operation and maintenance procedures will be developed for the proposed pipeline facilities. Manuals explaining these procedures will be made available to all operating personnel, who will be fully trained in their various duties and responsibilities. All manuals will comply in full with DOT Regulation 49 CFR 195, Transportation of Hazardous Liquids by Pipeline: Minimum Federal Safety

Standards, and state requirements such as the California Hazardous Liquid Pipeline Safety Act.

- o <u>Effectiveness</u>: These measures will insure that trained operators will have applicable safety information and contingency plans at hand.

[81] Communications for the proposed system will be connected to each of the booster/injection stations. The new booster stations for Segment 1 will be remotely controlled from an existing control center at Anaheim, California. Booster/injection stations at existing locations are manually controlled at the location. The Anaheim control center is a computer-based supervisory system with a second, fully-redundant computer which will provide immediate, automatic back-up in the event of a failure in the primary system. The system is capable of integrating all pump stations, terminals, automated shutoff valves, and delivery facilities into an overall network. An oil movements controller is on duty 24 hours a day and will be provided with standby power systems to maintain remote-control operation and shutdown capability in case of a power failure. Facilities to be controlled will be connected via a microwave system. These communication circuits will be used to continuously transfer operating information among the various locations in the network. The mainline valves will be provided with bevel-gear operators and will be located in accordance with DOT requirements. Radio communication will be available between stations and field mobile units to assist in dealing with any emergency.

- o <u>Effectiveness</u>: This system provides for rapid shutdown in the event of a spill.

[82] Certain operations and maintenance plans and schedules will be implemented to monitor and ensure safe pipeline operation. The permanent right-of-way, which in most cases will have been returned to its original use, will provide access for any necessary pipeline maintenance. The pipeline will be inspected routinely, utilizing aerial and ground surveys. These surveys will identify potential right-of-way use encroachments, pipeline exposure and mechanical damage, and other situations which might constitute a safety hazard. All valves and valve actuators will be routinely operated, inspected, and lubricated. Periodic surveys will also be conducted to ensure the continuity of the cathodic protection system and to indicate where preventative maintenance is required.

Routine aerial surveys of the right-of-way will be conducted once a week. Maintenance crews will make continuous general observations of the pipeline, and ground surveys of selected points will be made at least every two months. Block valve stations will be inspected twice a year, and cathodic protection stations at least twice a year. Unmanned booster and meter stations will be inspected at least once a week. All pipeline facilities will be marked and identified in accordance with applicable regulations.

- o <u>Effectiveness</u>: Encroachments upon and hazards to the pipeline from man-made or natural causes will be quickly detected and remediated. Valves will be operational at all times.

[83] The land required for above-ground ancillary facilities will be maintained free of vegetation and debris, as well as any private access roads associated with these facilities.

- o Effectiveness: This measure will insure that the pipeline and ancillary facilities will be accessible at all times.

[84] Booster stations will have the following fire protection and control systems for the gas turbine and heaters.

The gas turbine will have a fire detection and suppression system within the unit enclosure. This halon fire system will be incorporated into both the unit and the station programmable logic controllers to initiate emergency shutdown of both the pumping unit and the station in the event of a fire. The system will consist of temperature detectors, ultraviolet flame detection, and a halon storage and discharge system. It will be designed to initiate pump unit and station shutdown when any of the temperature detectors or flame detectors actuates, indicating the presence of a fire within the unit enclosure. Upon initiation of pump unit shutdown, the enclosure vents will close and the halon charge will be released into the unit enclosure in sufficient concentration to extinguish the flame.

The heaters will have a protective device system which will detect the presence of an abnormal fire within the unit. This system will be incorporated into both the unit and station programmable logic controllers to shut down both the heater and the station in the event of an abnormal fire within the heater. Since heaters utilize burners, the presence of a flame alone will not be sufficient to identify the presence of an abnormal (emergency) fire. The emergency fire detection system will consist of a temperature detector in the unit exhaust stack which will be activated when the stack temperature exceeds normal operating values. Upon actuation and initiation of emergency shutdown, heater process inlet and outlet valves, fuel valves, and inlet air dampers will be closed to eliminate the sources of combustion and extinguish the flame.

In addition to the automatic fire protection and control systems mentioned above, other fire protection equipment will consist of one 150-pound wheeled fire extinguisher and two 30-pound hand-held fire extinguishers. These extinguishers will be located within the control building and at key points in the station yard.

All operating and maintenance personnel will be trained in fire protection and in the use of basic fire fighting equipment. In addition, selected supervisory personnel will receive more extensive fire prevention and fire protection training as well as first aid courses dealing with the treatment of burns and other fire-related injuries.

- o Effectiveness: These measures will reduce the probability and severity of a fire or explosion originating inside the booster/injection stations, contain it on the site, and prevent injuries or property damage from such a fire.

Other Mitigation Measures

[85] A fire break of at least 25 feet will be kept free of vegetation on the periphery of the station.

- Effectiveness: The risk of a weed fire setting fire to the station will be reduced.

[86] In order to provide effective fire protection at the booster/injection stations in the event of a brush or weed fire, it is recommended that additional firefighting equipment be stored at each of the booster stations, including portable fire extinguishers for outdoor use; a 1,000-gallon water tank and portable pumping equipment; and shovels.

- Effectiveness: This additional equipment will provide effective fire protection against brush or weed fires near the booster stations, thereby minimizing potential damage to the station or pumps. No significant residual effect.

[87] Natural gas leak detection devices will be installed at all pump stations.

- Effectiveness: This measure will reduce the potential for explosion due to natural gas leaks to an insignificant level.

[88] The pumps of the booster stations will be equipped with seal leak detectors that would stop the pumps if excess seepage from the seal is detected. Valve stem packing will be inspected as part of the maintenance program.

- Effectiveness: These measures will increase the capability for leak detection and for initiating prompt remedial action if necessary.

6.2.14 Oil Spill Potential

Project Description Measures

[89] All applicable safety codes, regulations, design standards, and generally accepted industry practices will be complied with.

- Effectiveness: This will reduce the probability of an oil spill or leak due to design and construction flaws.

[90] The pipeline will be designed to accommodate geologic hazards, using earthquake-resistant design principles.

- Effectiveness: This measure will contribute to pipeline survival in the event of an earthquake.

[91] A pipeline exterior coating will be used at weld joints and a cathodic protection system will be installed.

- o Effectiveness: This system will minimize pipeline failures due to external corrosion.

[92] Radiographic (X-ray) inspection of pipeline welds and hydrostatic pressure testing will be used to nondestructively evaluate pipeline integrity.

- o Effectiveness: These techniques will prevent failures due to weld and pipe defects.

[93] Pressure relief valves and a sump system with high-level monitors and alarms to handle system overpressurizations will be used.

- o Effectiveness: This system will prevent pipeline damage due to pipeline pressure surge.

[94] A pipeline leak detection system, including 24-hour operator surveillance and remotely-controlled mainline shutoff valves, which will permit rapid response to a pipeline leak, will be used.

- o Effectiveness: By permitting rapid response to a pipeline leak, the amount of oil spilled will be minimized.

[95] The pipeline will be buried a minimum of three feet, and deeper in areas where deep plowing or ripping could result in damage to the pipeline. Also, aboveground pipeline markers to DOT regulations will be installed.

- o Effectiveness: These measures will help minimize pipeline failures due to external force or outside parties.

[96] The oil storage tank at Mid station will be surrounded by a containment dike to prevent spread of spilled oil and a high-level monitor and alarm will be used to prevent tank overfilling.

- o Effectiveness: These measures will contain the oil spill to the storage tank area as long as the berm remains intact.

[97] Block valves will be installed along the pipeline route no more than 30 miles apart.

- o Effectiveness: This measure will limit the volume of oil spilled in the event of a line break or leak to the oil present in the ruptured section between two valves.

[98] Pipeline right-of-way security will be maintained by frequent (weekly) aerial reconnaissance of the pipeline route, following DOT regulations.

- o Effectiveness: Encroachments upon and hazards to the pipeline will be quickly detected to allow removal of shrubbery and/or growth.

[99] Each pumping or injection station will be equipped with an uninterruptible power supply to prevent loss of remote system monitoring at the control center caused by loss of electrical power.

- o Effectiveness: By ensuring a continuous power supply, remote system control capability will be protected.

[100] The Oil Spill Contingency Plan will provide for effective personnel notification and action procedures, as well as local storage of spill cleanup equipment along the route, in order to reduce potential hazards to public or environmental damage from an oil spill. The proposed plan is included in this document in Appendix B. Special directives are given for response actions to be taken in the event of a spill in special areas, such as highways, streams, or farmlands. The plan lists oil spill cleanup equipment to be maintained at several areas along the pipeline route, as well as names and telephone numbers of outside oil companies and government agencies and fire departments. The plan provides for the training of all operating and maintenance personnel in emergency procedures and use of firefighting equipment and repair procedures. The effectiveness of personnel training will be evaluated annually.

- o Effectiveness: In general, the emergency response plans and mitigation measures are designed to protect both public safety (for example, in the case of an oil spill on a highway presenting a potential hazard to automotive traffic), and sensitive environmental resources.

[101] An electronic "pig" will be used to re-inspect the line periodically after pipeline operation begins. The scraper traps and pipeline could be designed to launch and pass an internal inspection tool. Use of electronic devices to re-qualify the pipeline in accordance with Section 51013.5 paragraph (d) and (g) of the California Pipeline Safety Act of 1979 would require a variance from the State Fire Marshall. By comparing the weld X-ray taken at periodic intervals, early identification of potential weld defects due to corrosion or other deterioration during pipeline operation will be possible. If defects are detected, the weld will be replaced.

- o Effectiveness: Detection of pipeline deterioration is not left to chance.

Other Mitigation Measures

The Oil Spill Contingency Plan will be updated to address sensitive habitats (see measure [80]). The manual block valves at Pacheco Creek will be automated (see measure [7]). Automatic block valves will be installed at the crossings of the California Aqueduct and Delta Mendota Canal (see measure [70]).

7. UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are the residual impacts that would exist in spite of the mitigation measures described in Section 6.

Geology and Topography

None identified.

Geological Hazards

A major earthquake could produce intense ground shaking and liquefaction, with resultant damage to ancillary facilities, particularly the Mid station storage area. Although the facilities are designed to withstand an earthquake of MMI VIII intensity, the risk of an oil spill persists as a small probability of occurrence. Low probability exists for a seismic event that would cause a >3-foot fault rupture at the Concord fault, and a resultant pipeline shear.

Soils

Revegetation failure on, the right-of-way is possible at sites subject to erosion, especially at those sites near or on steep slopes (>18%). These are found primarily in Contra Costa County. The soil conservation plan must address the issue of revegetation of erosion-prone areas.

Surface Water

The hazard of contamination by an oil spill of significant water resources, including the California Aqueduct, Pleasant Valley Aqueduct, Delta Mendota Canal, Bethany Reservoir, Contra Loma Reservoir, and Mokelumne Aqueduct, is a residual impact.

Groundwater

None identified.

Air Quality

None identified; a minor addition of emissions well below standards.

Noise

Exceeding local criteria (short-term) of about 60 dB(A) in a few recreation and residential areas could occur during construction (see Land Use and Recreation below).

Land Use and Recreation

The requirement for a permanent right-of-way and land for ancillary facilities, affecting less than 1,000 acres, is unavoidable.

Other adverse impacts include traversing the Bethany Reservoir State Park in Alameda County, and the Black Diamond Mines Regional Preserve, Stoneman Park and proposed reservoir, proposed residential developments, and proposed Highway 4 improvements in Contra Costa County. Residual impacts may be insignificant, depending on how these conflicts are resolved at the local level.

Visual Resources

By their nature, the new booster stations have a moderately significant impact on visual resources, since they are man-made structures. The residual impact will be relatively insignificant, however, since with proper screening and landscaping, these stations will blend in with other man-made features such as electric transmission lines in the area.

Paleontology

None.

Cultural Resources

None.

Terrestrial and Aquatic Biology

The residual impact consists of temporary habitat disturbance on the construction right-of-way and associated mortality of wildlife including in all probability a number of small mammals which are listed as threatened and endangered or candidates for designation: Tipton kangeroo rat, San Joaquin pocket mouse, and the San Joaquin antelope squirrel. The losses will be balanced by reproductive success following habitat restoration.

Construction will not be a mortality factor for the endangered kit fox, which occurs at several points along the entire project, because its dens have been identified and will be avoided by slight adjustments in the center line. The impact will be avoided in the same way on scattered oak trees in the Oak Savannah vegetation type, on sycamore trees along Orestimba Creek, and on a vernal pool. The revegetation of alkali sink and saltbush scrub habitat (native vegetation types) must be addressed in the soil conservation plan.

In the case of some other listed or candidate species, there is no significant impact because the habitat is marginal or not critical to these species and if present, representation is extremely limited and uncertain for some: California clapper rail and Alameda striped racer.

The blunt-nosed leopard lizard is so rare that any impact involving potential direct or indirect mortality and long-term habitat loss is significant for this species. The long-term requirement for right-of-way maintenance will exert certain periodic disturbances and is significant for most of the listed and candidate species addressed in this report, with the exception of those not probably present or dependent on this habitat (e.g., the peregrine falcon, and California clapper rail). This long-term impact requires mitigation in the form of restitution by either special habitat improvement or by establishing conservation easements securing the survival of species affected by the habitat loss due to the project and, on a regional scale, by land management trends or developments. If such compensatory measures are applied, the residual impact is not significant.

Operation and maintenance have less impacts than construction, if any impact at all that would be in addition to the long-term habitat loss described above.

However, any of the wildlife and habitats could be affected by a major oil spill, which could spread over several acres off the right-of-way and, unlike the pipeline, selectively impact a low spot (stream, wetland) where animal numbers tend to be relatively high during the summer. Whether a spill will affect endangered species cannot be predicted.

The estimated three spills of greater than 50 barrels over the life of the project could but are not likely to impact endangered/threatened species and unique habitat because 78% of the route is across cultivated, disturbed, and valley grassland (not native). The residual impact is a small risk of affecting unique areas,(alkali sink, saltbush scrub, oak savannah, riparian, brackish and freshwater wetlands and vernal pool) which the oil spill contigency plan has addressed.

8. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE/ ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The environment of the proposed pipeline route and its associated facilities would be affected primarily for the duration of the construction period. Construction of the pipeline will proceed at an average rate of about 1 mile per day and construction-related disturbances will affect the public in any one area for only a few days. Exhaust gas emissions, construction noise, and turbidity are all short-term construction impacts, as is the disruption of traffic flow patterns.

Right-of-way rehabilitation and revegetation will extend the time required to return the right-of-way environment to its original condition, but not by a significant period. In areas of scattered natural vegetation, right-of-way revegetation will be difficult, particularly on steep slopes. It may take years for natural vegetation to recover in the construction zone and/or to establish a satisfactory grass cover on that portion of the right-of-way which is to be permanently maintained. This impact is anticipated to occur in steeply sloping and stony portions of the right-of-way in Contra Costa County. The impact of the project on visual resources is not particularly significant because major portions of the route are aligned within existing corridors.

Since the pipeline will primarily be aligned within major existing transmission and transportation corridors on the western margin of the San Joaquin Valley, it will have long-term impacts which are in addition to those already present in that environment; these additional impacts are generally insignificant. If any paleontological or cultural resources conflict with the project, appropriate action will be taken to ensure their recovery and/or protection.

Endangered species are a major concern. Based on the results of the completed ground survey, the USFWS will offer its biological opinion; it may be necessary to apply certain avoidance actions to the region in general or it may be possible to avoid certain habitats through relatively minor deviations.

A major oil spill will have a significant impact, depending on where the spill occurs and on the response action. In this region, the risk of a spill requires consideration because of the seismic activity and the infrastructure in place to store and deliver the scarce surface water resources of the region to urban areas and croplands under irrigation in the valley. While an oil spill due to a seismic event could occur, this risk should not be overestimated; pipelines in the area during the Coalinga earthquake did leak but did not result in major spills of oil. The two proposed booster stations and the Mid station storage tank essentially are no more vulnerable than the existing pump stations or the existing Martinez refinery. Thus, the risk of a spill has been acceptable in the past, and it will be no different for a new pipeline. It is "a-fact-of-life" type of impact where oil production fields occur in a seismically active region, and requires the kind of contingency plans detailed in this report, particularly in regard to the protection of surface water resources.

The project, if permitted, will contribute to the economy of the region primarily by improving the present infrastructure available to transport oil from the Southern San Joaquin Valley to the Martinez refinery. It will not result in any significant economic growth, nor will it be accompanied by "boom-and-bust" economic phenomena. It will have certain local benefits over the life of the project in terms of receipts from taxes. Indirectly, it will make available pipeline capacity for other uses at a rate of 120 MBD. Most importantly, it will avoid:

- Increased use of trucks, tankers, or RML to transport the oil, which would be associated with unavoidable emissions, accidents, and spills; or

- Oil left in the ground for later use, which might lead to inefficient production and potential closure of the Martinez refinery.

9. IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

Construction and operation of the proposed project will result in the irreversible and irretrievable commitment of certain resources. These commitments are not judged to be highly significant provided the mitigation measures in Section 6 are incorporated into the proposed action. The commitments which are either irreversible or irretrievable, or both, are listed in Table 9-1.

Table 9-1

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Resource	Action Commitment	Irreversible	Irretrievable	Comment
Geology and Topography	Minor modification of steep slopes or unstable slopes	Yes	Yes	Mainly in Contra Costa County
	Unconsolidation of rock in trench area	Yes	Yes	Only in rockland areas lacking overburden
Geological Hazards	Construction in seismic region	Yes	No	Not a resource commitment
Surface Water	Construction oil spill	No	Yes	Significance is spill-dependent
Groundwater	Oil spill	No	No	Not significant
Air Quality	Construction, booster stations	No	Yes	Not significant
Socioeconomics	Transportation, taxes, infrastructure	No	No	Insignificant interaction
Noise, Land Use, and Recreation	Exceed short-term standards in noise-sensitive areas	Yes	No	Impact is insignificant; few noise-sensitive areas
	Changes in land use classification and associated production or present use	No	No	No prime agricultural land preempted; not significant based on small area required for facilities
	Conflicts with land use proposals (see Table 4-15)	No	No	Conflicts to be resolved through local planning process
Visual Resources	Booster stations and microwave tower facilities	No	No	Moderately significant pending site selection
Paleontology	Surficial resources on the right-of-way and in trench area	Yes	Yes	Not significant given small area requirements for project along 260 miles

Table 9-1 (Cont.)

Resource	Action Commitment	Irreversible	Irretrievable	Comment
Cultural Resources	One potentially significant site	Yes	No	The retrievability of these Resources resources renders the impact not significant
Terrestrial and Aquatic Biologic Resources	Individual mortality of listed species	Yes	No	This impact will be reversed by population recovery followng right-of-way revegetation
Oil Spill	Surface water resources, irrigated croplands and soils, and biological resources would be impacted	Yes	No	Some of the resources will be retrievable over time (e.g., surface water quality, soil productivity); significance is dependent on spill size, location, response action and time, and other factors

10. GROWTH-INDUCING IMPACTS OF THE PROJECT

The proposed project and its alternatives involve a short, intensive construction period, with a relatively small work force during construction and also during operation of the facilities. Temporary impacts on housing and transportation and other public services will not be significant and do not justify or require major capital improvements.

The proposed project will transport crude oil from the southern San Joaquin Valley to the Bay Area, but it will not modify existing refinery capacity or require additional refinery capacity. San Joaquin Valley crude can be refined elsewhere or in the Bay Area, and there is no direct relationship between the proposed project and the present overall refinery capacity in the state. Thus, impacts which would be associated with the requirement for new refineries are not anticipated for the present project. The proposed project is small in comparison to the general economic development of the state as well as that of the individual counties.

On the whole, the project will have minor economic advantages while improving the infrastructure for crude oil transportation.

11. BIBLIOGRAPHY

Note: References cited in special reports such as the biological assessment, cultural resources and paleontological Class I report, geotechnical assessment, and the air quality technical appendix are not contained herein.

Abernathy, John, May 23 and June 16, 1986, personal communication, Merced County Public Works Department, Solid Waste Division, Merced, California.

Adegoke, O.S., 1969, Stratigraphy and Paleontology of the Marine Neogene Formations of the Coalinga Region, California, University of California Publications, in Geological Sciences, Volume 80.

Alameda County, 1977, Specific Plan for Areas of Environmental Significance.

Alameda County General Plan, 1984, Noise Chapter, pp. 42-45.

Alameda County Planning Department, 1977, Livermore-Amador Valley Planning Unit General Plan (part of the Alameda County General Plan), Alameda, California.

Allen, Bill, May 14, 1986, personal communication, Planner, Alameda County Planning Department, Livermore, California.

Anderson, Carol, May 23, 1986, personal communication, Merced County Public Works Department, Solid Waste Division, Merced, California.

Anthony, Rick, May 22, 1986, personal communication, Fresno County Department of Public Works, Fresno, California.

Baker, Elna, 1972, An Island Called California, University of California Press, Berkeley, California.

Balestreri, A.N., 1981, Status of the San Joaquin Kit Fox at Camp Roberts, California, 1981, unpublished report, California Polytechnic State University, San Luis Obispo, California.

Barbour, Michael, and Jack Major, editors, 1977, Terrestrial Vegetation of California, John Wiley and Sons, New York.

Bedell, Robert, June 4, 1986, personal communication, City of Pittsburg, Community Development, Pittsburg, California.

Bennyhoff, James A., 1977, Ethnogeography of the Plains Miwok, University of California, Center for Archaeological Research at Davis, Publication 5.

Biotech, August 1983, A Study of the Biotic Resources of the Carnegie New Town Project, San Joaquin County, California.

Botti, F., D. Narenycia, and D. Becker, 1986, Utilization by Salt Marsh Harvest Mice Recthrodontomys raviventus halicuetes of a Non-pickleweed Marsh. California Fish and Game, 72(1):62-64.

Briggs, Louis I., Jr., June 1953, Geology of the Ortigalita Quadrangle, California, State of California, Division of Mines, Bulletin 167.

Brode, John, June 11, 1986, personal communication, California Department of Fish and Game, Inland Fisheries, Region 2.

__________, November 1976, Essential Habitat of the Blunt-nosed Leopard Lizard (Crotaphytus silus), Blunt-nosed Leopard Lizard Recovery Team.

Brown and Caldwell Consulting Engineers, August 1985, San Ramon Valley Reclamation Project, Project Report.

__________, letter dated January 28, 1986, to John B. Lien, State Lands Commission, from Terry M. Roberts.

Bull, William B., 1964, Alluvial Fans and Near-Surface Subsidence in Western Fresno County California, Studies of Land Subsidence, USGS Professional Paper 437-A.

Bureau of Land Management, 1985 (revised), Visual Resource Management Program.

California Department of Finance, 1985, Population Estimates, Sacramento, California.

California Department of Fish and Game, December 1980, At the Crossroads: A Report on the Status of California's Endangered and Rare Fish and Wildlife.

__________, August 1985, Summary of Major Studies on the Blunt-nosed Leopard Lizard (Gambelia silus), 1978-1982.

__________, 1985, Blunt-nosed Leopard Lizard Field Survey Methods.

California Department of Natural Resources, Division of Mines and Geology, 1954, Geology of Southern California, Bulletin 70.

__________, 1973, Bulletin No. 198, Urban Geology Master Plan for California.

__________, 1978, The Earthquake Epicenter Map of California, Map Sheet 39.

__________, 1983, Special Publication No. 66, The 1983 Coalinga, California, Earthquake.

California Department of Transportation, 1974, California Master Plan of State Highways Eligible for Official Scenic Highway Designation.

California Department of Water Resources, San Joaquin District, 1980, Groundwater Study, San Joaquin Valley, First Progress Report.

California Nature Conservancy, January 1984, Tulare Basin Protection Plan.

California-Oregon Transmission Project, letter dated May 21, 1986, to Gil Wistar, Ecology and Environment, Inc., from Laura Edlin, Public Affairs Director (maps enclosed).

California State Lands Commission and Bureau of Land Management, Department of the Interior, August 1984, Draft Environmental Impact Report/Environmental Impact Statement for the Celeron/All American and Getty Pipeline Projects, prepared by Environmental Research and Technology, Inc., State Clearing House No. 83110902.

Christenson, Dan, June 5, 1986, personal communication, Fisheries Biologist, California Department of Fish and Game, Region 4.

Church, C.C., 1968, The McKittrick Tar Seeps, American Association of Petroleum Geologists, Pacific Section, 1968 Guidebook.

City of Antioch, letter dated February 10, 1986, to John B. Lien, State Lands Commission, from Victor Carniglia, Senior Planner.

City of Antioch, General Plan.

City of Avenal, 1986, letter dated January 22, 1986, to John B. Lien, State Lands Commission, from Howard L. Ricks, Director of Public Works.

City of Martinez, letter dated February 10, 1986, to John B. Lien, State Lands Commission, from Richard Pearson, Director of Planning and Building.

City of Pittsburg, letter dated May 22, 1986, to Gil Wistar, Ecology and Environment, Inc., from Ron Lefler, Community Development Director (maps included).

Contra Costa County, 1974, Scenic Routes Element of the General Plan.

__________, 1978, East County Area General Plan.

__________, October 7, 1985, Draft EIR for Proposed East Contra Costa County Airport, Clearinghouse #85042304.

__________, November 1985, Growth Trends, Martinez, California.

__________, January 1986, Kirker Pass Waste Management Landfill, Draft Environmental Impact Report.

Contra Costa County Community Development Department, March 1986, "Recent Growth Trends in Contra Costa County."

Contra Costa County Planning Department, 1975, Contra Costa County General Plan, Seismic Safety Element.

__________, Noise Element, May 1975.

__________, East County Area General Plan Review Committee, 1978, East County Area General Plan, Contra Costa County, California.

Contra Costa County Public Works Department, March 1984, "State Route 4 Willow Pass Road to Bailey Road Improvement Project."

__________, 1982, West Pittsburg Area General Plan, West Pittsburg, California.

Contra Costa Water District, 1986, letter dated February 20, 1986, to John B. Lien, State Lands Commission, from Edward W. Cummings, Special Projects Engineer.

Cook, Sherburne F., 1955, The Aboriginal Population of the San Joaquin Valley, California, University of California Anthropological Records, 16(2):31-74.

__________, 1957, The Aboriginal Population of Alameda and Contra Costa Counties, California, University of California Anthropological Records, 16(4):131-156.

__________, 1960, Colonial Expeditions to the Interior of California: Central Valley, 1800-1820, University of California Anthropological Records, 16(6):239-292.

__________, 1962, Expeditions to the Interior of California: Central Valley, 1820-1840, University of California Anthropological Records, 20(5):151-213.

Cooper, Ken, May 14, 1986, personal communication, Assistant Superintendent of Maintenance, Hetch-Hetchy Water and Power Company, Moccasin, California.

County of Fresno, 1978, Fresno County General Plan, Scenic Highways (Section 304).

County of Fresno, letter dated February 19, 1986, to John B. Lien, State Lands Commission, from Jerry M. Bocen, Development Services Manager and Water Recorder, Staff Analyst III.

County of Merced, 1975, Scenic Route Element of the General Plan.

Coyle, Tom, May 16, 1986, personal communication, Superintendent, Kern County Parks and Recreation Department, Bakersfield, California.

Cripps, Thomas W., May 6, 1986, personal communication, Planner, Kern County Department of Planning and Development Services, Bakersfield, California.

Croft, M.G., 1972, Subsurface Geology of the Late Tertiary and Quaternary Water-Bearing Deposits of the Southern Part of San Joaquin Valley, California, USGS Geological Survey Paper 1999-H.

Crown County Corporation of Kings County, 1983, Economic Profile of Kings County, Hanford, California.

Deferrari, M., May 13, 1986, personal communication, Chief Property Appraiser, Stanislaus County, Modesto, California.

Dibblee, T.W., Jr., 1968, Geologic Map of Temblor Range, San Luis Obispo and Kern Counties, California, American Association of Petroleum Geologists, Pacific Section, <u>1968 Guidebook</u>.

__________, 1973, Regional Geologic Map of San Andreas and Related Faults in Carrizo Plain, Temblor, Caliente, and La Panza Ranges and Vicinity, California, USGS Miscellaneous Geologic Investigations Map I-757.

__________, 1977, Geologic Map of the Honker Bay Quadrangle, California, USGS Open File Report No. 80-2009.

__________, 1977, Geologic Map of Vine Hill Quadrange, USGS Miscellaneous Field Studies, Map MF-743, Scale 1:24,000.

Dienow, Bruce, June 9, 1986, personal communication, California Board of Equalization, Sacramento, California.

East Bay Regional Park District, 1976, Regional Trails Plan.

__________, 1980, Master Plan.

__________, 1984, Regional Trails Review; Completed Trails, Five-Year Plan.

Edminster, Dick, June 16, 1986, personal communication, Planner III, Alameda County Planning Department, Livermore, California.

Ellis, Roscoe, and Russell S. Adams, Jr., 1961, "Contamination of Soils by Petroleum Hydrocarbons," Advances in Agronomy, 13:197-216.

ESA, November 1984, DEIR Waterfront Business Park, City of Martinez, California, State Clearinghouse No. 84091101.

Estera-Jones, Mitzy, May 8, 1986, personal communication, Fresno County and City Chamber of Commerce, Fresno, California.

Federal Emergency Management Agency (FEMA), November 1979, Flood Insurance Study, San Joaquin County, California.

_________, February 1980, Flood Insurance Study, Stanislaus County, California.

_________, September 1982, Flood Insurance Study, Fresno County, California.

_________, March 1984, Draft Flood Insurance Study, Kern County, California, prepared for FEMA by Boyle Engineering Corporation.

Fisher, G.T., 1965, Adaptations in Harvest Mice of the Marshes of San Francisco Bay, 1971: Age Structure and Sex Ratio of Population of Reithrodontomys, J. Mamm., 52:653-662.

Florin, John, July 15, 1986, personal communication, Contra Costa County Traffic Operations, Martinez, California.

Foster and Guy, September, 1986, "The Microwave Problem," Scientific American, Vol. 255, No. 3, pp. 32-39.

Fresno County and City Chamber of Commerce, 1983, Fresno County Business Prospectus, Fresno, California.

Fresno County Planning Commision, 1985, Fresno County General Plan.

_________, Noise Element, adopted December 1975.

Fryer, L.W., and W.A. Cebell, 1984, Water Supply Report, 1984, Kern County Water Agency.

Gardner, Charles, June 12, 1986, personal communication, Director of Planning, Kings County Planning Agency, Hanford, California.

Gaylord, Ed, May 22, 1986, personal communication, Fresno County Department of Public Works, Fresno, California.

Gayton, Anna, 1948, "Yokuts and Western Mono-Ethnography," University of California Anthropological Records, 10(1-2):1-302.

Getty, B., 1983, Bureau of Land Management Impact Statement for Crude Oil Transportation System at Valdez, Alaska.

Gifford, E.W., and W. Egbert Schenck, 1926, Archaeology of the Southern San Joaquin Valley, California, University of California Publications in American Archaeology and Ethnology, 23(1).

Gray, Frank, June 11, 1986, personal communication, Fisheries Biologist, California Department of Fish and Game, Region 3.

Grim, Bob, May 8, 1986, personal communication, Fresno County Zoning, Fresno, California.

Grinnell, J., J.S. Dixon, and J.M. Kinsdale, 1937, Fur Bearing Mammals of California, Vol. 2, University of California Press, Berkeley.

Grinnell, J., 1932, Habitat Relations of the Giant Kangaroo Rat, J. Mamm., 13:305-320.

Hadano, M., May 22, 1986, personal communication, California Department of Parks and Recreation, Sacramento, California.

Hall, F.A., Jr., 1983, Status of the San Joaquin Kit Fox, Vulpes macrotic mutica, at the Bethany Wind Turbine Generating Project Site, Alameda County, California, Department of Fish and Game Report.

Hansen, J., June 17, 1986, personal communication, USDA Soil Conservation Service, Fresno, California.

Hanson, C.B., 1974, Preliminary Investigation of Paleontologic Resources: Pacific Gas and Electric Company, Fossil I and II, Theodoratus Cultural Research for Pacific Gas and Electric Company, San Francisco, California.

Harkins, Peter, May 6, 1986, personal communication, Development Services Division, Fresno County Public Works and Development Services Department, Fresno, California.

Harlon, Lauren, May 16, 1986, personal communication, California Regional Water Quality Control Board, Central Valley District.

Herd, Daniel G., 1979, Geologic Map of O'Neill Forebay, Western Merced County, California, USGS Open File Series 79-359.

Highway Research Board, 1971, Highway Noise: A Design Guide for Highway Engineers, National Cooperative Highway Research Program Report 117, National Research Council.

Hoffman, Don, May 22, 1986, personal communication, Kings County Public Works Department, Hanford, California.

Horton, Tom, June 16, 1986, personal communication, San Joaquin County Public Works Department, Solid Waste Disposal Division, Stockton, California.

Hulquist, Bob, May 9, 1986, personal communication, District Engineer, California Department of Health Services, Berkeley, California.

Hutchinson, T.C., J. Hellebust, and M. Telford, 1974, Institute for Environmental Studies, University of Toronto, Task Force on Northern Oil Development, Report No. 74-14.

Irons, Jerry, May 23 and June 16, 1986, personal communication, Stanislaus County Public Works Department, Modesto, California.

Jefferson, G.T., May 14, 1986, personal communication, Assistant Curator, Rancho La Brea Section, George C. Page Museum, Los Angeles, California.

Karas, Jim, July 16, 1986, personal communication, Engineering Manager, Bay Area Air Quality Management District.

Kelly, Randy, June 7, 1986, personal communication, Fisheries Biologist, California Department of Fish and Game, Region 4.

Kern County Board of Trade, 1985, "Guide to Hotels, Motels, and Resorts," Bakersfield, California.

__________, May 8, 1986, personal communication, Bakersfield, California.

__________, 1986, Statistical and Economic Profile of Kern County, Bakersfield, California.

Kern County Department of Planning and Development Services, 1986, Kern County Demographic Data, Bakersfield, California.

Kern County Department of Planning and Development Services, letter dated February 6, 1986, to John B. Lien, State Lands Commission, from Mark S. Hielty, Associate Planner.

__________, meeting held May 6, 1986, between Frederick C. Simon, Principal Planner, and Elizabeth Stetz, Ecology and Environment, Inc.

__________, meeting held May 6, 1986, between Thomas W. Cripps, Planner, and Elizabeth Stetz, Ecology and Environment, Inc.

Kern County General Plan, 1986, Land Use, Open Space and Conservation Elements.

Kiessling, E.W., 1970, Index to Geologic Maps of California, 1965-1968, California Division of Mines and Geology, Special Report 102.

Kiessling, E.W., and D.H. Peterson, 1977, Index to Geologic Maps of California, 1969-1975, California Division of Mines and Geology, Special Report 130.

Kings County Regional Planning Agency, 1974, Kings County General Plan, Seismic Safety Element.

_________, Noise Element, adopted June 1977.

Kings County Water District, 1981 (updated 1984), District Operations, Surface Water Inventory, Groundwater Conditions, and Related Data, Hanford, California.

Kroeber, Alfred L., 1925, Handbook of the Indians of California, Bureau of American Ethnology Bulletin, 78.

Latta, Frank, 1977, Handbook of the Yokuts Indians, Bear State Books, Santa Cruz, California.

Laudenslayer, W.F., Jr., and W.E. Grenfell, Jr., 1983, Outdoor California, 44(1):5-14.

Lefler, Ron., May 22, 1986, personal communication, Community Development Director, City of Pittsburg, California.

Leidy, J., 1865, "On Fossil Horses from California and Oregon," Philadelphia Academy of Natural Sciences Proceedings, p. 94.

Lettis, William R., Late Cenozoic Stratigraphy and Structure of the Western Margin of the Central San Joaquin Valley, California, USGS Open File Report 82-526.

Lindenmeyer, T.H., May 20, 1986, personal communication, Environmental Coordinator, East Bay Regional Park District.

Lucas, Cliff, May 22, 1986, personal communication, California Department of Water Resources, Sacramento, California.

Mackay, D., and M. Mohtadi, April 1975, "The Area Affected by Oil Spills on Land," The Canadian Journal of Chemical Engineering, 53:140-143.

Madrone Associates, 1979, Biological Assessment for the Blunt-nosed Leopard Lizard.

_________, 1979, Biological Assessment for the San Joaquin Kit Fox.

Maher, J.C., and W.M. Trollman, 1968, Geological Literature on the San Joaquin Valley of California, USGS, prepared in cooperation with the U.S. Department of the Navy, Office of Naval Petroleum and Oil Shale Reserves.

Marcussen, Glen, May 12, 1986 personal communication, City Manager, City of Coalinga, Coalinga, California.

Marks, Melinda, May 7, 1986, personal communication, Water Resources Division, Fresno County Department of Planning and Development Services, Bakersfield, California.

Matsinger, Herb, May 22, 1986, personal communication, California Department of Water Resources, Sacramento, California.

Merced County, 1978, General Plan.

Merced County Office of Economic and Strategic Development, 1985, Merced County: Gateway to the Future, Merced, California.

Merced County Planning Department, 1973, Merced County General Plan, Seismic Safety Element.

Merriam, J.C., 1915, Tertiary Vertebrate Faunas of the North Coalinga Region of California, American Philosophical Society Transactions, New Series, Vol. 22, Part 3, pp. 1-44.

Montanucci, R.R., 1965. Observations on the San Joaquin Leopard Lizard, _Crotaphytus wislizenii situs_, _Herpetologica_, 214:270-283.

Munz, Philip A., 1968, _A California Flora_, University of California Press, Berkeley, California.

Nomland, J.O., 1916, Relation of the Invertebrate to the Vertebrate Faunal Zones of the Jacalitos and Etchegoin Formations in the North Coalinga Region, California, University of California Publications, Bulletin of the Department of Geology, Vol. 9, No. 6, pp. 77-88.

Oceanographic Institute of Washington, 1978, _Oil Spill Risk Analysis for the Federal Northern Tier Pipeline Environmental Impact Statement_, Vols. 1 and 2, Bureau of Land Management Contract No. YA-512-CT8-105.

O'Farrell, T.P., 1980, Elk Hills Endangered and Threatened Species Program, Phase 1 Progress Summary, Topical Report EGG 1183-2403, EG&G, Santa Barbara Operations, U.S. Department of Energy, Goleta, California.

Page, B.M., 1945, Asphalt and Bituminous Sandstone Deposits of Part of the McKittrick District, Kern County, California, USGS Oil and Gas Investigations, Preliminary Map 35.

Pannell, Kerr, Forster, November 1985, _California Hotel Forest_, Sacramento, California.

Patterson, Dan, May 5 and June 4, 1986, personal communication, Department of Water Resources, California Aqueduct, Operation and Management.

Payne, M.B., 1974, Paleogene of the Panoche-Cantua Creek Area, Society of Economic Paleontologists and Mineralogists, Fall 1974 Guidebook, pp. 13-19, plates 1-5.

Perez, Jaime, May 23, 1986, personal communication, San Joaquin County Public Works Department, Solid Waste Disposal Division, Stockton, California.

Pieper, Rich, August 26, 1986, personal communication, U.S. Navy, Concord Naval Weapons Station, Concord, California.

Prokopovich, Nikola P., 1984, "Hydrocompaction Sinkholes in the San Joaquin Valley, California," Proceedings of First Multidisciplinary Conference on Sinkholes, Orlando, Florida, pp. 237-241.

Rayburn, Richard G., Chief, Resource Protection Division, California Department of Parks and Recreation, January 24, 1986, memorandum to John B. Lien, State Lands Commission.

Reynolds, J., June 9, 1986, personal communication, Chief, Research and Statistics, California Board of Equalization, Sacramento, California.

Reynolds, Robert, May 23, 1986, personal communication, Curator of Earth Sciences, San Bernadino County Museum, Redlands, California.

San Joaquin County, 1976, San Joaquin County General Plan, Socioeconomic Overview (Chapter II), Circulation (Chapter V), and Public Services and Utilities (Chapter VI).

San Joaquin Planning Commission, 1976, San Joaquin County General Plan, Land Use/Circulation, Open Space/Conservation, Recreation Elements.

San Joaquin County Planning Department, 1978, San Joaquin County General Plan, Seismic Safety Element.

__________, Noise Element, adopted November 1978.

San Joaquin Valley Pipe Line Company, letter dated May 23, 1986, to Cheryl Karpowicz, Ecology and Environment, Inc., from E.F. Paul, Senior Land Agent.

Schultz, Thomas J., and Nancy M. McMahon, 1971, Noise Assessment Guidelines, U.S. Department of Housing and Urban Development, Washington, DC.

Schwendinger, R.B., 1968, Institution of Petroleum Journal, 54:82-197.

Shellhammer, H., 1977, Of Mice and Marshes, San Jose Studies, 3(1): 23-25.

Simon, Frederick C., May 6, 1986, personal communication, Principal Planner, Kern County Department of Planning and Development Services, Bakersfield, California.

Society of Economic Paleontologists and Mineralogists, Fall 1972 Guidebook.

__________, Fall 1974 Guidebook.

Stanislaus Area Association of Governments, 1974, Stanislaus Area Environmental Resources Management Element, Recreation/Open Space.

Stanislaus County, 1982, Adopted Housing Element, Modesto, California.

Stanislaus County General Plan, 1977, Noise Element (Section 5).

Stanislaus County Planning Commission, 1975, A Comprehensive General Plan for the County of Stanislaus, California.

State of California, Department of Transportation, 1986, letter dated February 5, 1986, to John B. Lien, State Lands Commission, from Larry Burgess, IGR Coordinator.

Steele, Albert, May 7, 1986, personal communication, Fresno County Public Works and Development Services, Fresno, California.

Stinson, N.C., M.W. Manson, and J.J. Plappert, 1983, Mineral Land Classification: Aggregate Materials in the San Francisco - Monterey Bay Area, Special Report 146, State of California Department of Natural Resources, Division of Mines and Geology.

Stock, C., 1938,, The Tar Seeps of McKittrick, California, Carnegie Institute of Washington News Service Bulletin, Vol. 4, No. 32, pp. 262-264.

Taff, J.A., 1935, Geology of Mount Diablo and Vicinity, Geolog. Soc. America, Vol. 196, No. 7, pp. 1079-1100.

Takeuchi, Ken, June 12, 1986, personal communication, Parks Administrative Coordinator, Fresno County Parks and Recreation Department, Fresno, California.

Templin, William E., 1984, Ground-Water Quality Monitoring Network Design for San Joaquin Valley Ground Water Basin, California, USGC Water-Resources Investigations Report 83-4080, Sacramento, California.

The California Nature Conservancy, January 1984, The Tulare Basin Protection Plan.

Todd, David K. (compiled by), 1983 Groundwater Resources of the United States, Premier Press, Berkeley, California.

Todd, Robert, June 3, 1986, personal communication, California Department of Parks and Recreation, Contra Costa County.

Tweedie, Jeff, May 7, 1986, personal communication, Planning Office, Kern County Public Works and Development Services Department, Fresno, California.

University of California at Davis, Department of Soils and Plant Nutrition, April 1968, Soils of West Side Stanislaus Area, California.

U.S. Department of Agriculture, Soil Conservation Service, Stockton, California Soil Survey Office, July 1986, Unpublished Soil Survey of San Joaquin County, California.

________, September 1977, Soil Survey of Contra Costa, California.

________, May/June 1986, Fresno, California Area Office, Unpublished Soil Surveys of Kern, Kings, and Merced Counties.

U.S. Department of Commmerce, 1983, Climatic Atlas of the United States.

U.S. Department of Commerce, Bureau of the Census, 1980, General Housing Characteristics, California.

________, 1982, Census of Population and Housing, Washington, DC.

U.S. Department of Housing and Urban Development, November 1984, Flood Hazard Boundary Map, Contra Costa County, California.

U.S. Department of Transportation, 1980, Federal Interagency Committee Report on Urban Noise.

U.S. Environmental Protection Agency, 1982a, Petroleum Leak Detection Study, Office of Research and Development (ORD), EPA Contract No. 68-02-2352, Cincinnati, Ohio.

________, 1982b, Results of Studies of the North Platte River Oil Spill, Prepared by Dern and Polt Resource Consultants, Lander, Wyoming, EPA Contract No. 68-03-3014, Cincinnati, Ohio.

U.S. Fish and Wildlife Service, September 1985, Endangered and Threatened Wildlife and Plant; Review of Vertebrate Wildlife; Notice of Review, Federal Register.

________, June 29, 1983, Interagency Cooperation; Endangered Species Act of 1973; Proposed Rule, Federal Register.

________, October 1984, Listing Endangered and Threatened Species and Designating Critical Habitat; Amended Procedures to Comply with the 1982 Amendments to the Endangered Species Act; Final Rule, Federal Register.

U.S. Geological Survey, 1974, Interpretive Report 4.

________, 1984, Groundwater Quality Monitoring Network Design for the San Joaquin Valley Groundwater Basin, California, Water Resources Investigations Report 8341080.

________, 1984, Water Resources Data, California, Water Year 1984, Report CA-84.

Villa, Nick, June 4, 1986, personal communication, Fisheries Biologist, California Department of Fish and Game, Region 4.

White, D., May 22, 1986, personal communication, USDA Soil Conservation Service, Santa Rosa, California.

Whitlock, Clarence, July 15, 1986, personal communication, Pipeline System Operations Manager, Texaco Trading and Transportation Company.

Whitney, Stephen, 1979, A Sierra Club Naturalist's Guide, The Sierra Nevada, Sierra Club Books, San Franciso, California.

William, D.F., 1985, U.S. Fish and Wildlife Endangered Species Office, Sacramento, California, Final Report.

Wood, P.R., and G.H. Davis, 1959, Ground-Water Conditions in the Avenol-McKittrick Area, King and Kern Counties, California, USGS Water-Supply Paper 1457.

Woodring, W.P., R. Stewart, and R.W. Richards, Geology of the Kettlemen Hills Oil Field, California, USGS Professional Paper 195.

Woodward-Clyde Consultants, 1986, Characterization of Geologic Hazards, San Joaquin Valley Pipeline, Fellows to Martinez, California.

__________, 1986, Cultural and Paleontological Overview for the San Joaquin Valley Pipeline Project, Woodward-Clyde Consultants for San Joaquin Valley Pipe Line Company, Houston, Texas.

__________, letter dated June 4, 1986, to Cheryl A. Karpowicz, Ecology and Environment, Inc., from Jeff Dawson, Assistant Project Scientist.

Wooster, Ted, June 4, 1986, personal communication, California Department of Fish and Game, Region 3.

12. CONSULTATION AND COORDINATION

This section consists of a List of Preparers, which includes the names, educational background, years of experience, and project responsibilities of the persons involved in the preparation and review of the San Joaquin Pipeline Draft EIR/EIS; a Mailing List, which lists the persons and agencies which will receive copies of the Draft EIR/EIS; and Draft EIR/EIS Availability, which lists the libraries at which copies of the Draft EIR/EIS will be made available to the public.

12.1 LIST OF PREPARERS

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
STATE LANDS COMMISSION		
John B. Lien	M.S., Environmental Studies B.A., Geography 12 years of professional experience	Project Officer
Mary Griggs	B.A., Economics 9 years of professional experience	Socioeconomics, Project Description
Diana Jacobs	Ph.D., Candidate M.S., Wildland Resource Sciences B.S., Biological Sciences 7 years of professional experience	Terrestrial/Aquatic, Biology, Soils Surface Water
Randall Moory	M.S., Water Science B.A., Geology 13 years of professional experience	Systems Safety and Reliability, Geology, Groundwater, Air Quality, Project Description
Kirkman Walker	B.S., Biology/Geology/ Chemistry 15 years of professional experience	Cultural Resources, Geology, Biology
BUREAU OF LAND MANAGEMENT		
Ed Lynch	B.A., Biology M.S., Botany 15 years of professional experience	BLM Project Manager
Patricia Gradek	B.S., Natural Resources M.S., Watershed Manage- ment 10 years of professional experience	Groundwater, Surface Water

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
BUREAU OF LAND MANAGEMENT (Cont.)		
John W. Key	B.S., Agriculture M.S., Agriculture 12 years of professional experience	Soils, Geology
Jim Moore	B.A., Geology 7 years of professional experience	Geology, Geological Hazards
Marion Revitte	B.A., Anthropology M.A., Anthropology 7 years of professional experience	Cultural Resources
Larry Saslaw	B.S., Wildlife Management 10 years of professional experience	Terrestrial and Aquatic Biology
ECOLOGY AND ENVIRONMENT, INC.		
Cheryl Karpowicz Project Manager	B.A., Urban Studies University of Rochester 12 years of professional experience	Project Management
Peter Brokx Assistant Project Manager	Ph.D., Biology University of Waterloo, Canada M.S., Wildlife Zoology University of Guelph, Canada B.S., Agriculture McGill University, Canada 25 years of professional experience	Project Management, Terrestrial and Aquatic Biology

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
ECOLOGY AND ENVIRONMENT, INC. (Cont.)		
Gil Wistar Technical Editor Project Coordinator	B.A., Environmental Science University of Virginia 5 years of professional experience	Technical Editing and Coordination
Hussein Aldis Task Manager	B.S., Geology University of London, England B.S., Landscape Architecture University of Kentucky 25 years of professional experience	Geology, Topography, Geologic Hazards, Groundwater
Elizabeth Stetz Technical Specialist	B.A., Environmental Sciences West Virginia University at Morgantown 7 years of professional experience	Terrestrial and Aquatic Biology
Louise Mango Task Manager	M.B.A., State University of NY at Buffalo M.S., Natural Resource Economics/Land Use Planning Michigan State University B.S., Botany Duke University B.A., Economics Duke University 9 years of professional experience	Noise, Land Use, Socioeconomics, Transportation
Gerard Gallagher Technical Specialist	B.A., Physical Geography State University College of NY at Buffalo 5 years of professional experience	Soils

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
ECOLOGY AND ENVIRONMENT, INC. (Cont.)		
Steve Sherman Technical Specialist	M.S., Environmental Health NY University B.S., Environmental Biology State University of NY at Buffalo 5 years of professional experience	Noise
Margaret Farrell Technical Specialist	B.A., Environmental Science State University of NY at Binghamton B.A., Biology State University of NY at Binghamton 8 years of professional experience	Land Use and Recreation
Joseph Hoffman Technical Specialist	M.A., Mathematics University of Rochester B.A., Physics State University of NY at Buffalo 12 years of professional experience	Systems Safety and Oil Spills
Fred McKosky Technical Specialist	M.S., Environmental Engineering Clarkson University B.S., Environmental Biology Clarkson University 7 years of professional experience	Surface Water and Oil Spills
Peter Venema Technical Specialist	B.S., Mechanical Engineering B.S., Chemical Engineering P.E. State of California 29 years of professional experience	Energy Use

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
ECOLOGY AND ENVIRONMENT, INC. (Cont.)		
Robert Michael Technical Specialist	B.A., Geology Pomona College California Registered Geologist 16 years of professional experience	Geology and Geologic Hazards
PEAK AND ASSOCIATES		
Robert Gerry	B.A., Anthropology University of Illinois at Chicago Circle 10 years of professional experience	Cultural Resources, Field Director
Ann Peak	M.A., Anthropology California State University, Sacramento B.A., Anthropology California State University, Sacramento 14 years of professional experience	Prehistoric Resources
Melinda Peak	M.A. Candidate, History California State University, Sacramento B.A., Anthropology University of California, Berkeley 11 years of professional experience	Historical Resources
Ken Owens	Ph.D., History University of Minnesota B.A., History Lewis and Clark College Portland, Oregon 30 years of professional experience	Historical Resources

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
C. BRUCE HANSON		
C. Bruce Hanson	Ph.D., Candidate, Paleontology University of California, Berkeley M.S., Paleontology South Dakota School of Mines and Technology B.S., Geology University of Minnesota 21 years of professional experience	Paleontologic Resources
SYSTEMS APPLICATIONS, INC.		
Gerald Anderson	M.S., Gas Dynamics University of Minnesota B.S., Gas Dynamics University of Minnesota 34 years of professional experience	Air Quality
ENVIROMENTAL SCIENCE ASSOCIATES		
Mark Winsor	Ph.D., Geography University of Wisconsin B.A., Geography and Landscape Arizona State University 15 years of professional experience	Visual Resources
Paul Sugnet	M.S., Rangeland Ecology and Management B.S., Conservation of Natural Resources University of California, Berkeley 7 years of professional experience	Terrestrial and Aquatic Resources

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
ENVIRONMENTAL SCIENCE ASSOCIATES (Cont.)		
Leslie Moulton	B.A., Human Biology Stanford University 3 years of professional experience	Terrestrial and Aquatic Resources
Nona Dennis	M.S., Candidate, Environmental Studies University of San Francisco B.A., Humanities Northwestern University B.S., Biology California State, Sonoma 20 years of professional experience	Terrestrial and Aquatic Biology

12.2 MAILING LIST

Alameda County Planning Dept.
399 Elmhurst Street, Room 136
Hayward, CA 94544

Contra Costa Planning Dept.
P.O. Box 951
Martinez, CA 95443

Fresno County Planning Dept.
4475 E. Kings Canyon Road
Fresno, CA 93702

Kern County Planning Dept.
1103 Golden State Avenue
Bakersfield, CA 93301

Kings County Planning Dept.
Government Center
Hanford, CA 93230

Merced County Planning Dept.
2222 M Street
Merced, CA 95340

Stanislaus County Planning Dept.
1100 H Street
Modesto, CA 95354

San Joaquin County Planning Dept.
1810 E. Hazelton Avenue
Stockton, CA 95205

City of Taft Planning Dept.
209 E. Kern Street
Taft, CA 93268

Martinez Planning Dept.
525 Henrietta Street
Martinez, CA 94553

Pittsburg Community Development Dept.
65 Civic Avenue
Pittsburg, CA 94565

Clayton Planning Dept.
P.O. Box 380
Clayton, CA 94517

Antioch Planning Dept.
P.O. Box 130
Antioch, CA 94509

Brentwood Planning Dept.
708 3rd Street
Brentwood, CA 94513

City of Tracy Community Development Dept.
325 E. Tenth Street
Tracy, CA 95376

Patterson Planning Dept.
P.O. Box 667
Patterson, CA 95363

Newman Planning Dept.
P.O. Box 787
Newman, CA 95360

Gustine Planning Dept.
P.O. Box 306
Gustine, CA 95322

Coalinga Planning Dept.
City Hall
6th & Elm Streets
Coalinga, CA 93210

City of Avenal Planning Dept.
P.O. Box 128
Avenal, CA 93204

Concord Planning Dept.
Civic Center
1950 Parkside Drive
Concord, CA 94519

Los Banos Planning Dept.
P.O. Box 31
Los Banos, CA 93635

City of Wasco Planning Dept.
P.O. Box 159
Wasco, CA 93280

Bay Area AQMD
939 Ellis Street
San Francisco, CA 94109

Stanislaus County APCD
1716 Morgan Road
Modesto, CA 95351

Fresno County APCD
P.O. Box 11867
Fresno, CA 93775

Kern County APCD
1601 H Street, Suite 250
Bakersfield, CA 93301-5199

San Joaquin County APCD
P.O. Box 2009
Stockton, CA 95201

Kings County APCD
330 Campus Drive
Hanford, CA 93230

Merced County APCD
P.O. Box 471
Merced, CA 95341

Belridge Water Storage District
P.O. Box 1087
Bakersfield, CA 93302

Davis Water District
P.O. Box 98
Westley, CA 95387

Centinella Water District
P.O. Box 98
Westley, CA 95387

Central California
Irrigation District
P.O. Box 1231
Los Banos, CA 93635

Del Puerto Water District
P.O. Box 98
Westley, CA 95387

Hospital Water District
P.O. Box 98
Westley, CA 95387

Kern Canyon Water District
P.O. Box 98
Westley, CA 95387

Lansdale Water District
P.O. Box 98
Westley, CA 95387

Lost Hills Water District
1601 F Street
Bakersfield, CA 93301

Mustang Water District
P.O. Box 98
Westley, CA 95387

Oak Flat Water District
P.O. Box 98
Westley, CA 95387

Plain View Water District
30215 South Tracy Boulevard
Tracy, CA 95376

Pleasant Valley Water District
P.O. Box 557
Coalinga, CA 93210

Quinto Water District
P.O. Box 98
Westley, CA 95387

Romero Water District
P.O. Box 98
Westley, CA 95387

San Luis Water District
P.O. Box 2135
Los Banos, CA 93635

Santa Nella County Water Dist.
P.O. Box 722
Gustine, CA 95322

Sunflower Water District
P.O. Box 98
Westley, CA 95387

West Kern Water District
P.O. Box MM
Taft, CA 93268

Westlands Water District
P.O. Box 6056
Fresno, CA 93703

Mr. Ed Lynch
Bureau of Land Management
Federal Office Building
800 Truxtun Avenue
Bakersfield, CA 93301

Mr. Holden Brink
Bureau of Land Management
2800 Cottage Way, Rm. E. 2915
Sacramento, CA 95825

P.E. Wallace
San Joaquin Valley Pipe Line Co.
P.O. Box 5006
2600 Kitty Hawk Road, #125
Livermore, CA 94550

EPA, Region IX
215 Fremont Street
San Francisco, CA 94105

U.S. Fish and Wildlife Service
Endangered Species Office
1230 North Street
Sacramento, CA 95814

U.S. Corps of Engineers
Sacramento District
650 Capitol Mall
Sacramento, CA 95814

U.S. Corps of Engineers
San Francisco District
211 Main Street
San Francisco, CA 94105

U.S. Navy Concord Weapons
WPNSTA Concord Code
Concord, CA 09202

Federal Communications
Commission
Gettysburg, PA 17325

Federal Aviation Administration
Lymore Station
Air Traffic Division
Box 92007
World Postal Center
Los Angeles, CA

Occupational Safety and
Health Administration
245 West Broadway
Long Beach, CA

Ann Geraghty
Air Resources Board
1131 S Street
Sacramento, CA 95814

Greg Newhouse
California Energy Comm.
1516 Ninth Street, Room 200
Sacramento, C 95814

Mary Melly
CalTrans-Planning
1120 N Street
Sacramento, CA 95814

Dennis O'Bryant
Dept. of Conservation
1416 Ninth Street, Room 1326-2
Sacramento, CA 95814

Robert Tharratt
Dept. of Fish & Game
1416 Ninth Street
Sacramento, CA 95814

Harry Krade
Dept. of Food & Agriculture
1220 N Street
Sacramento, CA 95814

Dennis Orrick
Dept. of Forestry
1416 Ninth Street, Room 1516-2
Sacramento, CA 95814

Loretta Allen
Native American Heritage Comm.
915 Capitol Mall, Room 238
Sacramento, CA 95814

Hans Krautzberg
Office of Historic Preservation
P.O. Box 2390
Sacramento, CA 95811

James Doyle
Dept. of Parks & Recreation
P.O. Box 2390
Sacramento, CA 95811

George Hersh, Env. Section
Public Utilities Comm.
350 McAllister Street, Room 5198
San Francisco, CA 94102

Mel Schwartz
Reclamation Board
1416 Ninth Street
Sacramento, CA 95814

Ken Fellows
Dept. of Water Resources
1416 Ninth Street, Room 215-1
Sacramento, CA 95814

J.M. Ellis
CalTrans-District 4
P.O. Box 7310
San Francisco, CA 94120

Mert Parlier
CalTrans-District 6
P.O. Box 12616
Fresno, CA 93778

John Gagliano
CalTrans-District 10
P.O. Box 2048
Stockton, CA 95201

Joan Jurancich
State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA 95801

Fred H. Dierker, Executive Officer
Regional Water Quality Control Board
San Francisco Bay Region (2)
1111 Jackson Street, Room 6040
Oakland, CA 94607

William H. Crooks, Executive Dir.
Regional Water Quality Control Bd.
Central Valley Region (5)
3201 S Street
Sacramento, CA 95816

P. Jensen, Regional Manager
Dept. of Fish & Game
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670

G. Mokes, Regional Manager
Dept. of Fish & Game
1234 East Shaw Avenue
Fresno, CA 93726

Bureau of Indian Affairs
Washington, D.C.

National Park Service
Washington D.C.

Bureau of Land Management
Washington, D.C.

Nuclear Regulatory Commission
Bethesda, Maryland

Bureau of Mines
Washington, D.C.

Soil Conservation Service
Washington, D.C.

Bureau of Reclamation
Washington, D.C.

U.S. Air Force
San Francisco, CA

Department of Energy
Washington, D.C.

Environmental Protection Agency
Washington, D.C.

Federal Regulatory Commission
Washington, D.C.

U.S. Fish and Wildlife Service
Washington, D.C.

U.S. Geological Survey
Reston, VA.

12.3 DRAFT EIR/EIS AVAILABILITY

Beale Memorial Library
1315 Truxtun Avenue
Bakersfield, CA

San Benito Co. Library
470 5th Street
Hollister, CA 95023

California State Library (3 copies)
Government Publications Section
P.O. Box 2037
Sacramento, CA 95809

California State University, Chico
Library-Government Publications Center
Chico, CA 95929

California State University, Long Beach
Library-Government Publications
6101 East 7th Street
Long Beach, CA 90840

Fresno County Free Library
Government Publications
2420 Mariposa
Fresno, CA 93721

Los Angeles Public Library
Serials Division
630 West 5th Street
Los Angeles, CA 90071

Oakland Public Library
125 14th Street
Oakland, CA 94612

San Diego Public Library
Science and Industry Dept.
820 East Street
San Diego, CA 92101

Council of State Governments
Iron Works Pike
Lexington, KY 40505
Attn.: Research Librarian

University of California, San Diego
Central University Library
Documents Department
La Jolla, CA 92093

Contra Costa Co. Library
740 Court
Martinez, CA

Merced County Library
1312 7th Street
Los Banos, CA

San Diego State University
Malcolm A. Love Library
5402 College Avenue
San Diego, CA 92182

University of California, Berkeley
General Library-Documents Dept.
Berkeley, CA 94720

San Francisco Public Library
Documents Dept.
Civic Center
San Francisco, CA 94102

University of California, Riverside
Library-Government Publications Dept.
P.O. Box 5900
Riverside, CA 92507

Library of Congress (2 copies)
Exchange and Gift Division
Monthly Checklist Section
Washington, DC 20540

Stanford University Libraries
Government Documents Dept.
Stanford, CA 94305

University of California, Davis
Shields Library-Documents Dept.
Davis, CA 95616

University of California, Santa Barbara
Library-Government Publications Section
Santa Barbara, CA 93106

California State Archives (2 copies)
1020 "O" Street
Sacramento, CA 95814

California Polytechnic University,
San Luis Obispo
Library-Government Publications Section
San Luis Obispo, CA 93407

California Dept. of Justice Library
3580 Wilshire Boulevard, Room 701
Los Angeles, CA 90010

College of the Redwoods
Del Norte Education Center
683 West Washington Boulevard
Crescent City, CA 95531

University of Washington
Government Publications Section, H-25
Seattle, WA 98195

University of Illinois
Library-Documents Division
Urbana, IL 61801

Library of Congress (2 copies)
Exchange and Gift Division
Monthly Checklist Section
Washington, DC 20540

LIST OF ACRONYMS AND ABBREVIATIONS

AAPG - American Association of Petroleum Geologists

ANSI - American National Standards Institute

APCD - Air Pollution Control District

API - American Petroleum Institute

ASTM - American Society for Testing and Materials

BAAQMD - Bay Area Air Quality Management District

BACT - Best Available Control Technology

BBL - barrels

BLM - Bureau of Land Management

BTU - British thermal unit

CDFG - California Department of Fish and Game

CEQA - California Environmental Quality Act

CFR - Code of Federal Regulations

cfs - cubic feet per second

CNEL - Community Noise Equivalent Level

CO - carbon monoxide

COE - (U.S. Army) Corps of Engineers

dB - decibels

dB(A) - decibels A-weighted

DOT - (U.S.) Department of Transportation

DWR - (California) Department of Water Resources

EIR - Environmental Impact Report

EIS - Environmental Impact Statement

EPA - (U.S.) Environmental Protection Agency

FEMA - Federal Emergency Management Agency

FERC - Federal Energy Regulatory Commission

HC - hydrocarbons

JRP - Joint Panel Review

L_{dn} - day-night (average sound) level

MBD - thousand barrels per day

MMI - Modified Mercalli Intensity

NAAQS - National Ambient Air Quality Standards

NEPA - National Environmental Policy Act

NFPA - National Fire Protection Association

NO_x - nitrogen oxides

NPDES - National Pollutant Discharge Elimination System

OIW - Oceanographic Institute of Washington

OSHA - Occupational Safety and Health Administration

O_3 - ozone

ppm - parts per million

PSD - Prevention of Significant Deterioration

PUD - planned unit development

SCAQMD - South Coast Air Quality Management District

SCS - Soil Conservation Service

SEPM - Society of Economic Paleontologists

SJVPLC - San Joaquin Valley Pipe Line Company

SLC - (California) State Lands Commission

SWRCB - State Water Resources Control Board

TDS - Total Dissolved Solids

TSP - total suspended particulates

USCG - U.S. Coast Guard

USDA - U.S. Department of Agriculture

USFWS - U.S. Fish and Wildlife Service

VMC - Visual Management Class

VRMP - Visual Resource Management Program

APPENDIX A

DETAILED PROJECT MAPS

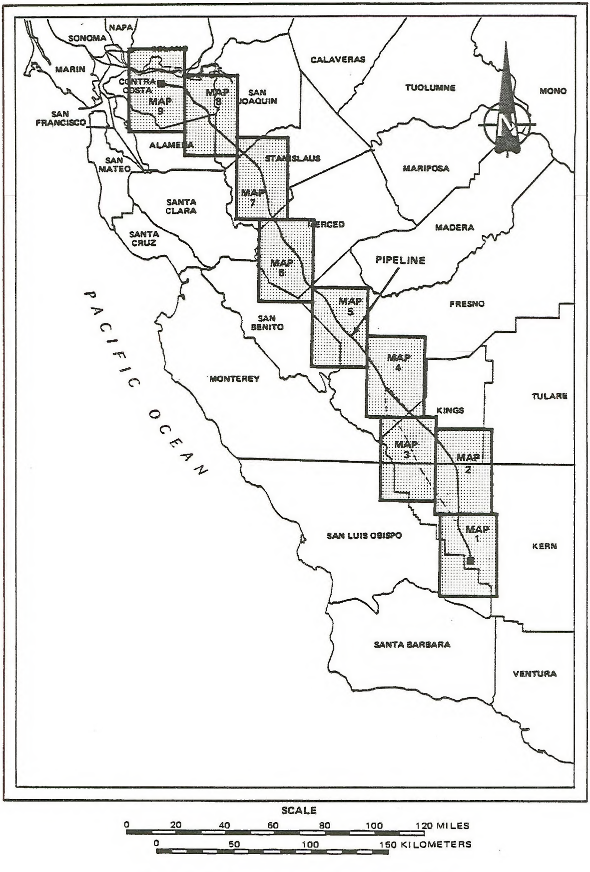
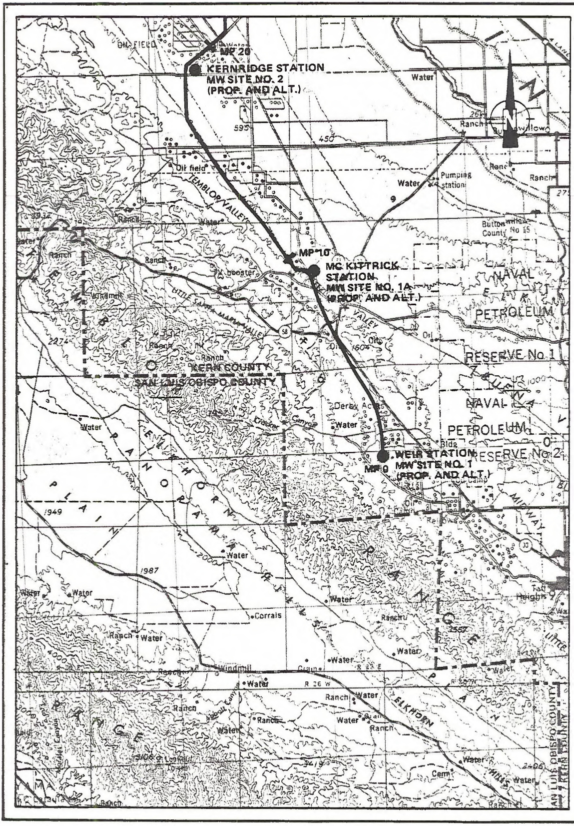
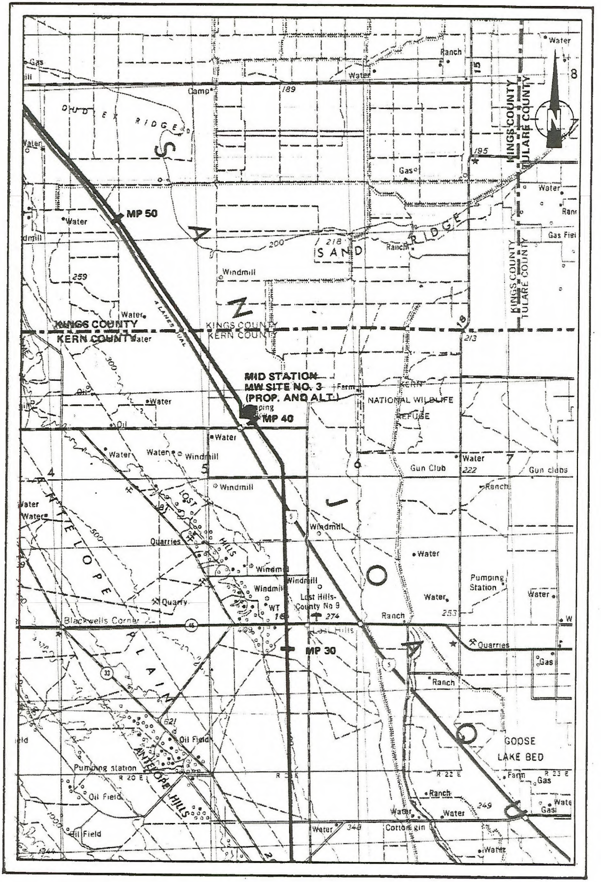


Figure 0–0 LOCATIONS OF NINE AREA MAPS

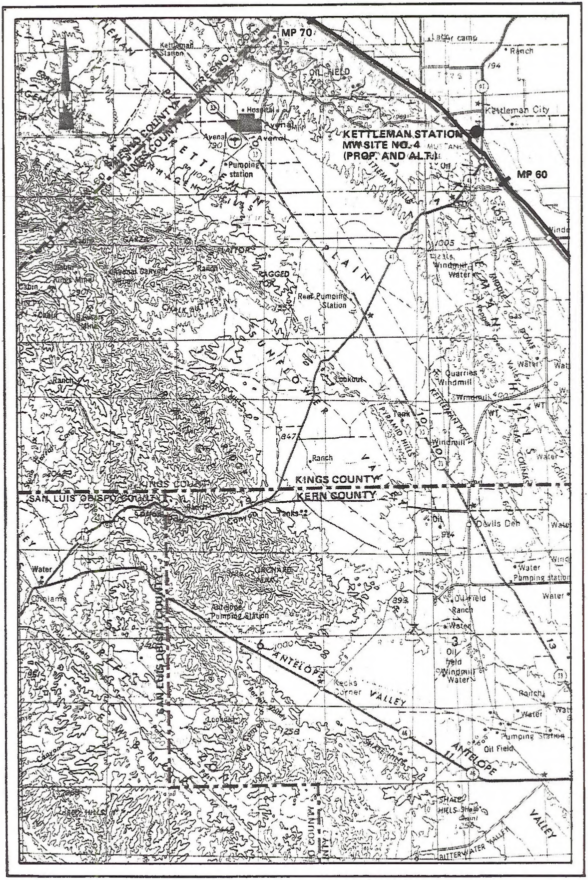


MP 20
KERNRIDGE STATION
MW SITE NO. 2
(PROP. AND ALT.)
MP 10
MC KITTRICK
STATION
MW SITE NO. 1A
(PROP. AND ALT.)
WEIR STATION
MW SITE NO. 1
(PROP. AND ALT.)
MP 0
KERN COUNTY
SAN LUIS OBISPO COUNTY
NAVAL
PETROLEUM
RESERVE No 1
NAVAL
PETROLEUM
RESERVE No 2
TEMBLOR VALLEY
ELKHORN
Water
Ranch
Oil field
Pumping station
Corrals
Windmill

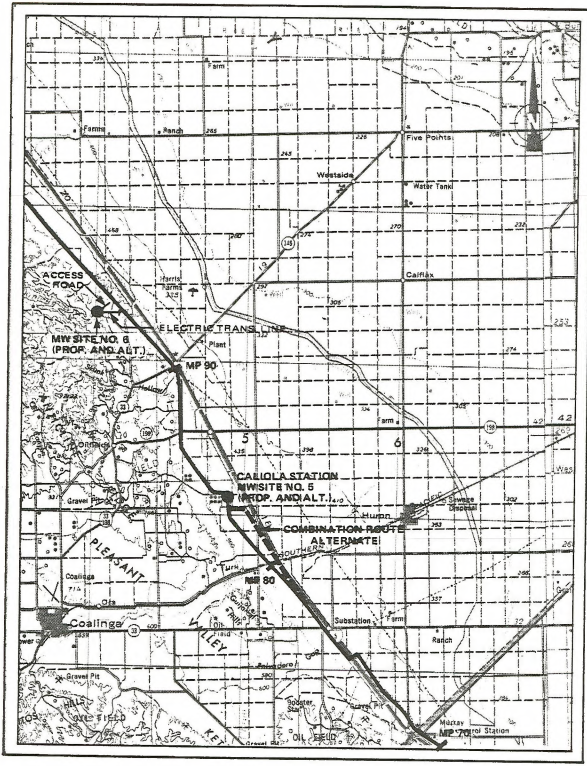
MAP 1


MP 50
MID STATION
MW SITE NO. 3
(PROP. AND ALT.)
MP 40
MP 30
KINGS COUNTY
KERN COUNTY
TULARE COUNTY
KERN NATIONAL WILDLIFE REFUGE
SAND RIDGE
DUDLEY RIDGE
ANTELOPE PLAIN
ANTELOPE HILLS
LOST HILLS
GOOSE LAKE BED
Blackwells Corner
Gun Club
Gun clubs
Pumping Station
Quarries
Oil Field
Windmill
Water
Ranch
Gas
Cotton gin

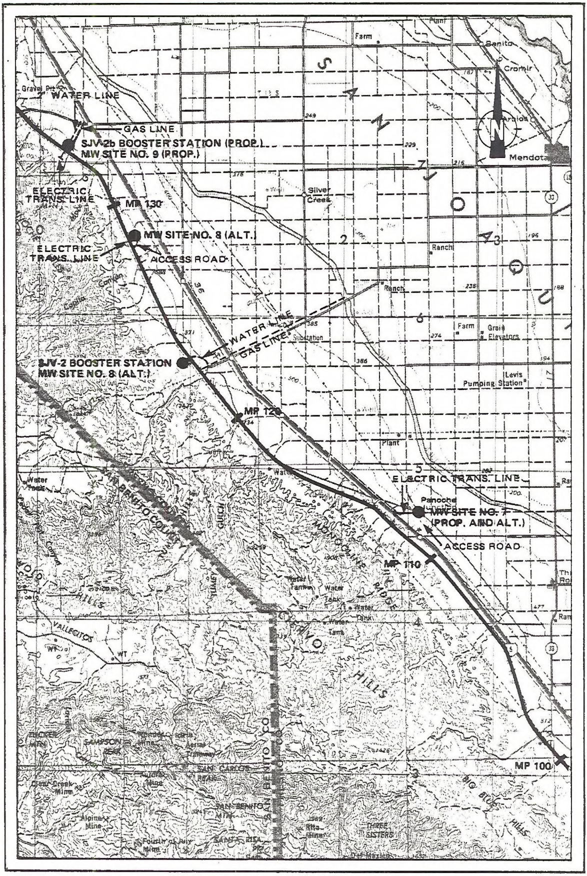
MAP 2


MP 70
MP 60
KETTLEMAN STATION
MW SITE NO. 4
(PROP. AND ALT.)
Kettleman City
Labor camp
Ranch
OIL FIELD
Hospital
Avenal
Pumping station
FRESNO COUNTY
KINGS COUNTY
RAGGED TOP
CHALK BUTTES
Reef Pumping Station
Lookout
PYRAMID HILLS
Windmill
Water
KINGS COUNTY
KERN COUNTY
SAN LUIS OBISPO COUNTY
Davis Den
Pumping station
ORCHARD PEAK
Antelope Pumping Station
Cholame
Oil Field
ANTELOPE VALLEY
Kecks Corner
Pumping Station
BITTERWATER VALLEY

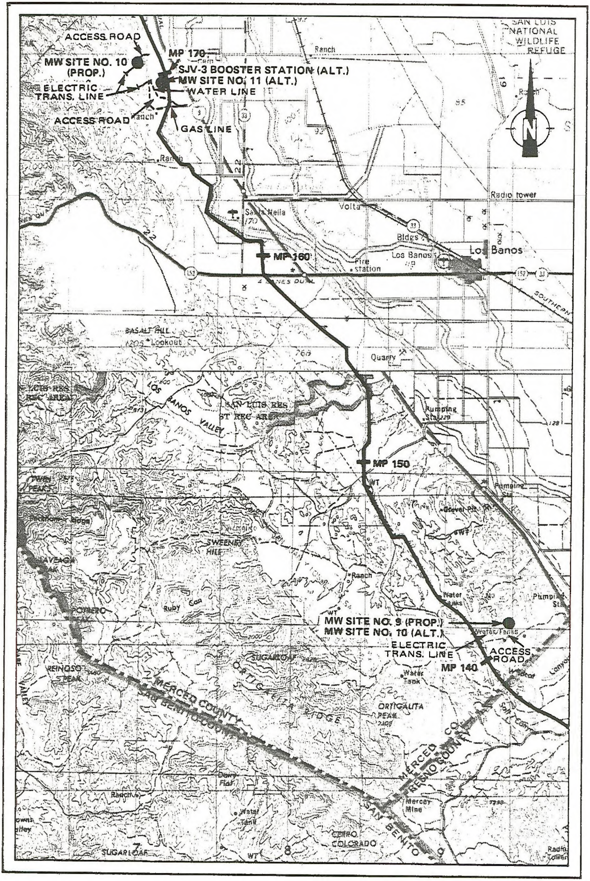
MAP 3


ACCESS ROAD
MW SITE NO. 6
(PROP. AND ALT.)
ELECTRIC TRANS LINE
MP 90
CALIOLA STATION
MW SITE NO. 5
(PROP. AND ALT.)
COMBINATION ROUTE
ALTERNATE
MP 80
MP 70
Five Points
Westside
Water Tank
Calflax
Harris Farms
Plant
Huron
Sewage Disposal
Coalinga
Pleasant
Valley
Substation
Farm
Ranch
Gravel Pit
Oil Field
Murray

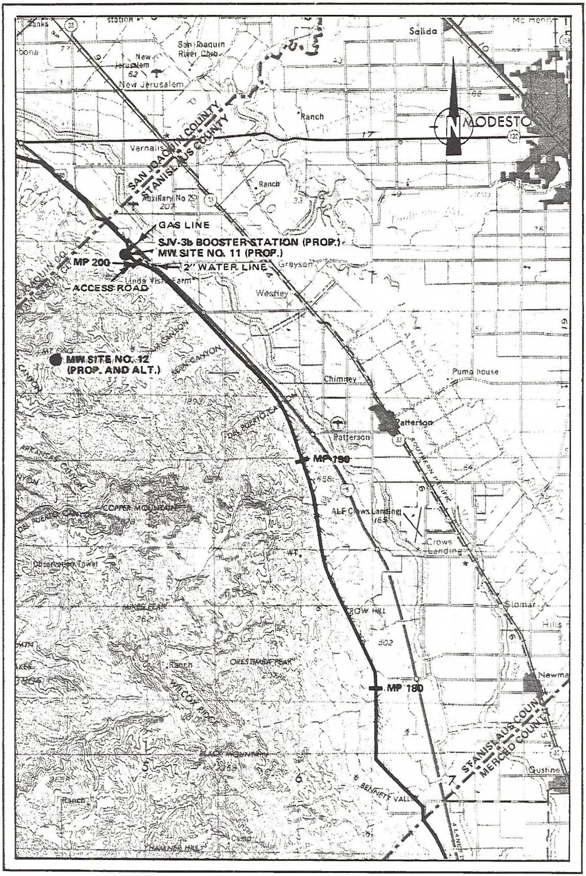
MAP 4


WATER LINE
GAS LINE
SJV-2b BOOSTER STATION (PROP.)
MW SITE NO. 9 (PROP.)
ELECTRIC TRANS. LINE
MP 130
MW SITE NO. 8 (ALT.)
ELECTRIC TRANS. LINE
ACCESS ROAD
WATER LINE
GAS LINE
SJV-2 BOOSTER STATION
MW SITE NO. 8 (ALT.)
MP 120
ELECTRIC TRANS. LINE
MW SITE NO. 7
(PROP. AND ALT.)
ACCESS ROAD
MP 110
MP 100
Mendota
SAN JOAQUIN
SAN BENITO COUNTY
Panoche Junction
Silver Creek
Levis Pumping Station
Grain Elevators
Substation
Ranch
Farm
Plant
Water Tank
CIERVO HILLS
BIG BLUE HILLS
VALLECITOS
SAMPSON PEAK
SAN CARLOS PEAK
Clear Creek Mine
Alpine Mine
Fourth of July Mine
San Benito Mine
Aerial Tramway
THREE SISTERS
Gravel Pit
Cromir
Benito

MAP 5

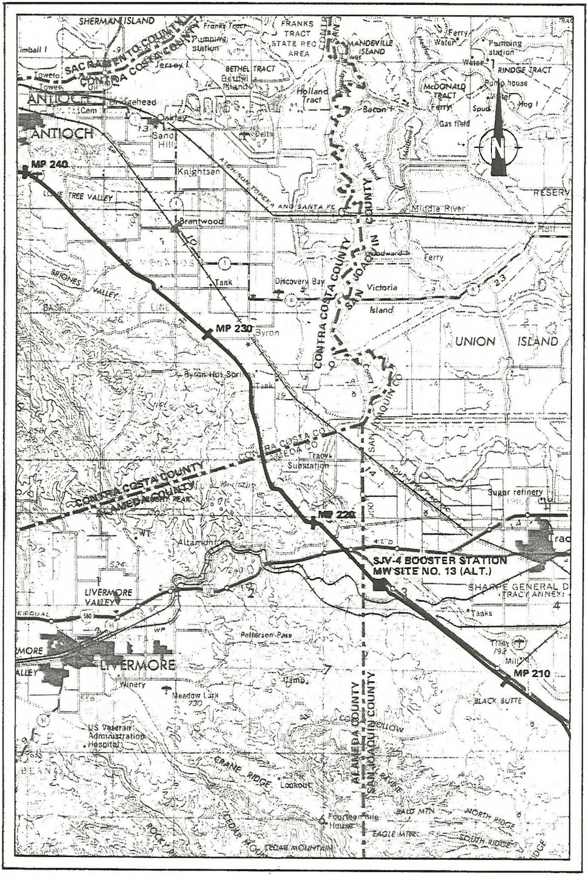

ACCESS ROAD
MW SITE NO. 10 (PROP.)
ELECTRIC TRANS. LINE
ACCESS ROAD
MP 170
SJV-3 BOOSTER STATION (ALT.)
MW SITE NO. 11 (ALT.)
WATER LINE
GAS LINE
SAN LUIS NATIONAL WILDLIFE REFUGE
Radio tower
Volta
Santa Nella
MP 160
Los Banos
Fire station
BASALT HILL
Quarry
LOS BANOS VALLEY
SAN LUIS RES ST REC AREA
MP 150
SWEENEY HILL
MW SITE NO. 9 (PROP.)
MW SITE NO. 10 (ALT.)
ELECTRIC TRANS. LINE
ACCESS ROAD
MP 140
SUGARLOAF
ORTIGALITA RIDGE
ORTIGALITA PEAK
REINOSO PEAK
MERCED COUNTY
SAN BENITO COUNTY
MERCED CO.
FRESNO COUNTY
CERRO COLORADO
Mercey Mine

MAP 6



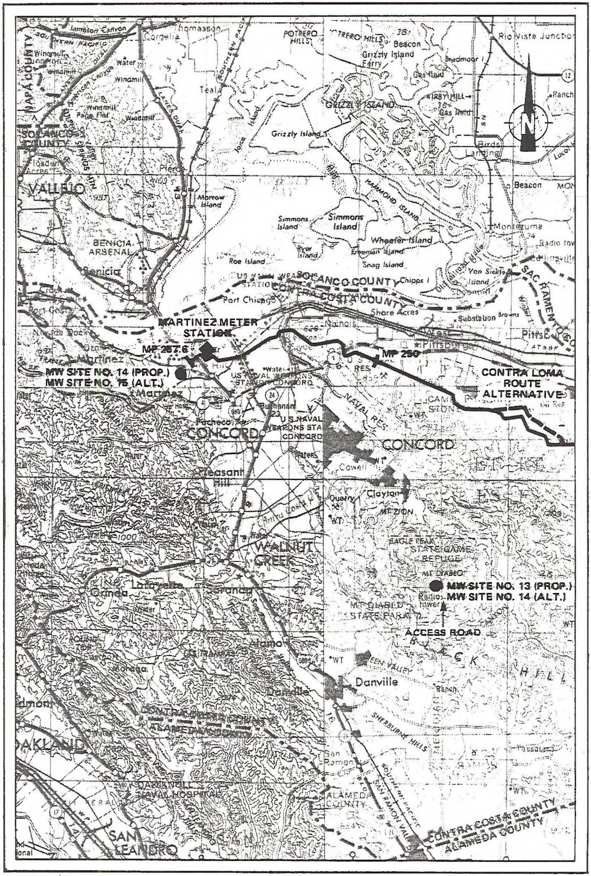
MODESTO
SAN JOAQUIN COUNTY
STANISLAUS COUNTY
GAS LINE
SJV-3b BOOSTER STATION (PROP.)
MW SITE NO. 11 (PROP.)
MP 200
2" WATER LINE
ACCESS ROAD
MW SITE NO. 12
(PROP. AND ALT.)
MP 190
MP 180
STANISLAUS COUNTY
MERCED COUNTY
Salida
Vernalis
New Jerusalem
Westley
Patterson
Crows Landing
Newman
Gustine
Chimney
Grayson
COPPER MOUNTAIN
DEL PUERTO CANYON

MAP 7



MP 240
MP 230
MP 220
MP 210
SJV-4 BOOSTER STATION
MW SITE NO. 13 (ALT.)
ANTIOCH
LIVERMORE
Brentwood
Knightsen
Oakley
Byron
Discovery Bay
Altamont
UNION ISLAND
CONTRA COSTA COUNTY
SAN JOAQUIN COUNTY
ALAMEDA COUNTY
SACRAMENTO COUNTY
Middle River
Victoria Island
Tracy Substation
Sugar refinery
SHARPE GENERAL D
(TRACY ANNEX)
Patterson Pass
CRANE RIDGE
CEDAR MOUNTAIN
BLACK BUTTE
N

MAP 8


MARTINEZ METER STATION
MP 257.6
MP 250
MW SITE NO. 14 (PROP.)
MW SITE NO. 15 (ALT.)
CONTRA LOMA ROUTE ALTERNATIVE
MW SITE NO. 13 (PROP.)
MW SITE NO. 14 (ALT.)
ACCESS ROAD
N
SOLANO COUNTY
CONTRA COSTA COUNTY
ALAMEDA COUNTY
CONCORD
WALNUT CREEK
Danville
Clayton
Martinez
Benicia
VALLEJO
OAKLAND
SAN LEANDRO

MAP 9

APPENDIX B

OIL SPILL CONTINGENCY PLAN

OIL SPILL CONTINGENCY PLAN

SAN JOAQUIN VALLEY PIPELINE SYSTEM

INDEX

THE SAN JOAQUIN VALLEY PIPE LINE COMPANY PLANS TO ENTER INTO AN AGREEMENT WITH SHELL COVERING THE OPERATION AND MAINTENANCE OF THE SAN JOAQUIN VALLEY PIPELINE SYSTEM. ACCORDINGLY, THIS PLAN WAS DEVELOPED BY SHELL TO COVER ITS OPERATIONS IN NORTHERN CALIFORNIA AND HAS BEEN EXPANDED TO INCLUDE THE SAN JOAQUIN VALLEY PIPELINE.

OIL SPILL CONTINGENCY PLAN

SAN JOAQUIN VALLEY PIPELINE SYSTEM

I N D E X

Shell Oil Company

P.O. Box 4848
511 N Brookhurst Street
Anaheim, California 92803

September 25, 1985

Shell Pipe Line Corporation
ATTN Mr. M. J. Eichler, Manager
Regulations and Maintenance Standards
Two Shell Plaza
P. O. Box 2648
Houston, TX 77252

Gentlemen:

SJV HEATED OIL PIPELINE

Pursuant to your request, we are enclosing for your further handling Northern District Emergency Plan which has been updated to include the subject proposed pipeline.

The only revision in the plan necessary to accommodate emergency situations with respect to the subject pipeline was to add the various emergency departments of Merced, San Joaquin and Stanislaus County to Section 7 as the response provisions of the plan are applicable and appropriate.

Yours very truly,

R. D. Kerick
West Coast Division
(Pipelines) - Products

RDK:GM

Attachment

cc - P. E. Wallace, SPLC - Land and Environmental Dept. (w/attachment)
D. J. Boldra, SOC - General Engineering (w/attachment)

cc - West Coast Division (Pipelines) - Products
Northern District Superintendent

SECTION 1 - PREAMBLE

PURPOSE

The purpose of this manual is to provide basic procedures to be used by Shell personnel in the event of hazardous liquid pipeline emergency conditions in order to minimize hazard to the public and to assure public safety and welfare. Property is to be protected but only after the public has been adequately protected.

REGULATIONS

Federal regulations 49 CFR 195.402(a) and (e) and the State of California Pipeline Safety Act of 1981 require that a pipeline operator establish and maintain written procedures for the handling of liquid pipeline emergencies in order to minimize any resulting hazard. The manual is to be reviewed at intervals not exceeding 15 months but at least every calendar year and appropriate changes made as are necessary to insure that the manual remains effective. The manual shall be kept by operations and maintenance supervisors at locations where operations and maintenance activities are conducted.

The manual must include the following procedures for liquid pipeline systems in order to minimize any hazard resulting from a pipeline emergency:

1. Receiving, identifying, and classifying notices of events which require immediate response.

2. Establishing and maintaining adequate means of communication with appropriate fire, police and other public officials.

3. Prompt and effective response to a notice of each type of emergency, including the following:

   °Fire located near, or directly involving a pipeline facility.

   °Explosion occurring near, or directly involving a pipeline facility.

   °Release of LPG or anhydrous ammonia from a pipeline facility.

   °Natural disaster.

4. Availability of personnel, equipment, tools and material, as needed at the scene of an emergency.

5. Actions directed toward protecting people first, then property.

6. Emergency shutdown and pressure reduction in any section of the pipeline system necessary to minimize hazard to life or property, including closing of block valves on both sides of the failure, and in the case of systems transporting LPG, continuation of pumping until LPG has been replaced at point of failure by a less volatile product, provided vapors are not accumulating to such an extent that a serious hazard appears imminent.

7. Making safe any actual or potential hazard to life or property. Minimization of public exposure to injury and prevention of accidental ignition by evacuation of residents and the halting of traffic on roads, highways and railroads in the affected area.

8. Notifying appropriate fire, police and other public officials of liquid pipeline emergencies and coordinating with them previously planned emergency responses during an emergency, including additional precautions necessary with failures from pipeline systems transporting LPG or anhydrous ammonia.

9. Personnel shall be informed concerning the characteristics of the liquid petroleums/anhydrous ammonia in the piping systems and the

safe practices in the handling of accidental release and repair of facilities with emphasis on the special problems and additional precautions in the handling of failures and repairs of systems transporting LPG or anhydrous ammonia.

10. Establish scheduled reviews with personnel of procedures to be to be followed in emergencies at intervals not exceeding six months, to ensure the competence of the emergency plan.

11. In the case of pipeline systems transporting LPG or anhydrous ammonia, assessment of extent and coverage of the LPG or anhydrous ammonia vapor cloud and determination of hazardous area with portable explosimeters for LPG; also, possible ignition of LPG vapors at leak site to prevent the uncontrolled spread of vapors.

The pipeline operator shall also:

1. Furnish operations and maintenance supervisors who are responsible for emergency action with the latest edition of the emergency procedures.

2. Train the appropriate operating personnel to ensure that they are knowledgeable of the emergency procedures and maintain written records verifying that the training is effective.

3. Review employee activities to determine whether the procedures were effectively followed in each emergency and maintain records covering such reviews.

4. Establish and maintain liaison with appropriate fire, police, and other public officials to:

  °Learn the responsibility and resources of each government organization that may respond to a liquid pipeline emergency;

  °Acquaint the officials with the operator's ability in responding to a liquid pipeline emergency;

  °Identify the types of liquid pipeline emergencies of which the operator notifies the officials; and

  °Plan how the operator and officials can engage in mutual assistance to minimize hazards to life or property.

5. Establish a continuing educational program to enable customers, the public, appropriate government organizations, and persons engaged in excavation related activities, to recognize a liquid

pipeline emergency for the purpose of reporting it to the operator or the appropriate public officials. The program and the media must be as comprehensive as necessary to reach all areas in which our pipelines transport liquids. The program must be conducted in English and in other languages commonly understood by a significant number and concentration of the non-English speaking population in the operator's area.

INTRODUCTION

The preferred method of handling hazardous liquid pipeline emergencies is to prevent their occurrence and this can best be achieved by adhering to Shell's established operating procedures, preventive maintenance programs and good housekeeping practices, including pipeline testing, maintenance and repair record plans as provided for in Shell manual entitled "Pipeline Inspection and Maintenance Manual".

The Alert and Action procedures set forth in Section 2 are to be implemented in the event of a liquid pipeline emergency condition (including but not limited to leaks, operational failure causing a hazardous condition, natural disasters affecting pipelines, fire or explosion directly or indirectly involving a pipeline) which, if properly completed, will result in correction of the emergency condition and minimize hazard to the public.

These procedures provide guidelines for the handling of most emergencies, and include notification to 1) company personnel, 2) outside companies where necessary, and 3) appropriate governmental agencies. The Action element enumerates retainment, containment and clean-up techniques specifically developed for the facilities at locations with the following topographical or artificial features:

1) Streams, Creeks and Small Rivers

2) Flood Control Channels and Large Rivers

3) Ship Harbor and Marinas

4) Storm Drains

5) Street areas, street intersections and freeways.

6) Farm, ranch or range lands.

In addition to the post emergency review required under Paragraph 11 of Section 2, this plan will also be reviewed annually at the start of each calendar year by the District, and any changes deemed appropriate by the District to the continued or improved effectiveness of the plan will be forwarded to the Division. Any revisions in the plan will be distributed to appropriate personnel.

The District Superintendent shall have the responsibility of establishing and maintaining liaison with fire, police and other appropriate governmental departments to 1) learn the resources of such departments to assist Shell during an emergency, 2) to acquaint such departments with Shell's response to an emergency, and 3) to establish alternate communication methods with such departments personnel in the event normal telephone contacts become impossible.

SECTION 2 - ALERT PROCEDURES

Upon being advised that an emergency condition exists, the Shell party receiving the information should obtain if possible the name, address and telephone number of the calling party, the location, nature and magnitude of the emergency and shall then immediately notify the following depending on the location of the emergency condition.

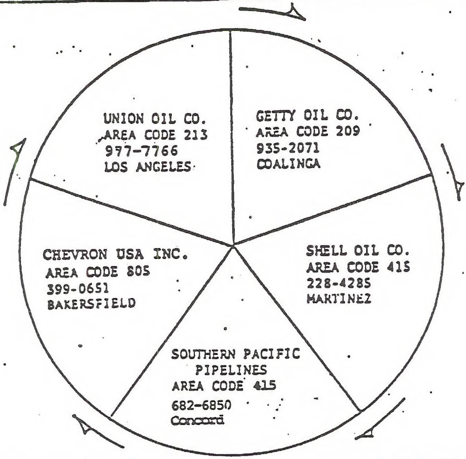
BAY AREA

°If in the Bay Area, notify the Southern Pacific Pipeline dispatcher at 213/624-9461, Extension 22148 who will initiate Call Wheel notification in accordance with Page 2-1a.

And then, call the following Shell supervisory personnel in their listed order until one is reached:

NAME	TITLE	OFFICE	RESIDENCE
J. Freitas	Opers.Foreman	415/651-5890	415/634-1304
B.T.Johnson	District Supt.	805/399-6576	805/832-5506
J.B.Hite	Division Manager	714/991-9200	714/380-9334
Anaheim Controller		213/482-8191	

BAY AREA PIPELINER'S ORGANIZATION LEAK REPORT



DATE __________
TIME __________
DISP. __________

REPORTED TO YOU BY:
COMPANY __________
PERSON __________

INITIAL REPORT BY:
COMPANY __________
(IF an individual)
Name __________
Add. __________
Phone __________
City __________

(THOMAS BROS.) (PL-S13174)
Petro-Pipelines North. Calif.
PAGE __________

LETTER __________

NUMBER __________

COUNTY OF __________

CITY OF __________

CLAIMED BY:

____

LEAK IS:
- LARGE ☐
- SMALL ☐
- RUNNING ☐

- CRUDE ☐
- PRODUCTS ☐
- GAS ☐
- WATER ☐
- UNKNOWN ☐

____

RELAYED TO:
NAME __________
COMPANY __________

ADDITIONAL INFORMATION: __________

____

____

____

____

Time

SAN JOAQUIN VALLEY

If in the San Joaquin Valley, notify the Getty Oil Company dispatcher at 209/935-2071 who will initiate Call Wheel notification in accordance with Page 2-2a hereof.

And then, call the following Shell supervisory personnel in their listed order until one is reached:

BAKERSFIELD/WASCO

NAME	TITLE	OFFICE	RESIDENCE
C.R.Thompson	Operations Superv.	805/399-5595	805/399-3729
R.W.Holman	Maint. Foreman	805/399-5595	805/322-1329
J. D. Blanton	Asst. Opns. Foreman	805/399-5595	805/399-5617
B.T.Johnson	District Supt.	805/399-6576	805/832-5506
J.B.Hite	Division Manager	714/991-9200	714/380-9334
Anaheim Controller		213/482-8191	

MID/CALIOLA

L.G.Butcher	Maint.Foreman	805/935-1521	209/935-3168
W.L.Stone	Opers.Foreman	805/935-1522	209/935-1744
B.T.Johnson	District Supt.	805/399-6576	805/832-5506
J.B.Hite	Division Manager	714/991-9200	714/380-9334
Anaheim Controller		213/482-8191	

The contacted Supervisor will proceed immediately to the reported location, verify the emergency condition and its cause, and then initiate the steps necessary to effect prompt and effective corrective action. If the emergency condition is a leak or line break, the on-site Supervisor shall immediately put the following procedures into action:

1. Stop the line flow either by shutting down the line or closing all manually-operated valves necessary to minimize volume losses. Valve and pertinent facilities locations should be located by reference to the facility Y-drawings maintained in the field offices.

2. Ascertain and initiate all steps necessary to immediately minimize all existing hazards first to life, and then to property, including the accidental ignition of vapors if present, evacuation of the area if necessary, and assisting with traffic control in the area if appropriate.

3. Implement the applicable location procedures listed under Action Procedures required for containment, clean-up and repair of the leak in a prompt and effective manner, including on-site mobilization of all essential Shell personnel and emergency equipment. The appropriate contractors listed in Section 8 are to be called to the site if considered necessary by the on-site Supervisor under then existing conditions.

4. Notify the following:

°The appropriate police and fire departments of <u>all</u> pipeline leaks or spills.

°Those Federal, State or local governmental or regulatory agencies listed in Section 7 as requiring notice based on the nature and class of the emergency condition as defined in Section 7.

°The California State Fire Marshal in the case of <u>all</u> leaks or spills.

5. Notify other Shell personnel as follows:

NAME	TITLE	OFFICE	RESIDENCE
J. A. Mendoza	Technical Supt.	714/991-9200	714/777-6112
E.M.Munger	Public Affairs - Los Angeles Manager	213/835-5611	415/549-9372 415/228-6161

For possible insurance claims:

R.D.Kerick - Sr. Staff Land Agent, 714/991-9200 Ext. 746 213/325-0092

For spills involving marine loading operations:

Marine Service Section of Marine Department
(24-Hour Number) 713/220-2532

6. Implement and coordinate previously planned responses to the emergency with police, fire and other officials at the site to promptly minimize any hazards first to life and then to property.

7. Notify other companies if their facilities in the area appear to be involved.

8. After clean-up, containment and repairs are completed, follow up with involved public agencies and private parties to assure that clean-up operations are satisfactory.

9. Maintain accurate and precise records including conversations with all personnel contacted and all other pertinent data which may assist in ascertaining causes of the spill and in settlement of damage claims.

10. After the emergency is under control, promptly prepare all reports required by Shell and any governmental agencies.

11. Provide for post emergency review to determine if the emergency procedures were effective and to correct any deficiencies that may be found to exist.

SECTION 3 - ACTION PROCEDURES

In the event of a line leak or break, one of the following procedures applicable to the pipeline location shall be immediately implemented to correct the emergency condition as soon as possible in order to minimize hazard first to life and then property.

STREET AREAS, INTERSECTIONS, FREEWAYS

Every effort must be made to contain the spill in as small an area as possible. Vacuum trucks are to be dispatched immediately to the spill location along with crews and barricades and other equipment for traffic control, sand, absorbent materials, brooms, shovels and booms to contain flow toward storm drains and sewers. If vacuum trucks are not immediately available, then straw, hay or excelsior shall be spread on the surface of the spill. These materials will absorb the oil and will require removal and replenishment as they become saturated. All precautions must be taken to assure pedestrian safety in the area of the leak and also to see that traffic conditions are properly handled to eliminate any large scale congestion or possible accident.

STREAM BEDS

Spills into stream beds must be contained as quickly as possible to avoid downstream pollution. Depending on the spill substance the appropriate following procedure will be implemented:

Product Procedure

At an appropriate location downstream of the spill, ahead of any standing product in the creek, dam the flow of water to make a ponding area. This will allow product to rise to the surface. A log boom or other floating device will allow water to flow while the product ponds. It may be necessary to make a suitable diversion around the pond using portable pumps. Take steps to keep people and animals out of the area and promptly notify the appropriate law enforcement agency.

Immediately after making a stand, get as many vacuum trucks as possible to use in recovering the product. A water spray or a board on a broom stick is helpful for pushing the spill into the vacuum hoses. Where product is not deep enough on top of the water for recovery, it may be sprayed with an appropriate disbursing chemical which will reduce the fire hazard. If foam is available nearby it should be used if necessary to reduce fire danger.

Clean up of the stream after the product has been removed will depend on the requirements of local agencies. This could consist of chemical treatments, removing debris from the stream and restoring the area to as near normal as possible.

Crude Oil

At some appropriate location downstream of the spill, ahead of any oil in the creek, dam the flow of water to make a ponding area. This will allow the oil to gather on the surface of the still water. A chain of logs floating across the pond will allow the water to pass while holding the oil. It may be necessary to make a suitable diversion around the pond using portable pumps.

Immediately after making a stand, as many vacuum trucks as feasible should be used to suck the oil off the pond. Care should be taken to suck the oil fast enough so that it does not go over the dam. A board on a handle, or a water spray is often useful for herding the oil towards the vacuum trucks and away from the dam.

Once the main pool of oil has been taken from the ponding area, the rocks, plants, trees, etc. in the stream bed can be cleaned with appropriate chemicals which free the oil from the water and turn it into an emulsion.

The emulsion can be swept into the ponding area and sucked up by the vacuum trucks. If the stream bed is turbulent enough, it is possible to allow the emulsion to flow downstream. However, it should be remembered that if the emulsion is allowed to pool for eight hours or more, there is a chance the oil may reappear.

Clean-up of oil scum is most easily done with excelsior. It should be scattered on the scum and allowed to absorb it. Reapply again as often as needed.

HARBOR AND MARINAS

If a spill pollutes a harbor or marina the probability of contaminating boats, wharfs, slips and other structures abutting the estuary is quite high and a contractor listed in Section 8 as familiar with oil spills in water areas shall be immediately called to the scene.

FARM, RANCH AND RANGE LANDS

As in all spills, every effort should be made to contain the oil/product in as small an area as possible. The effects of spills in these types of areas not only has immediate consequences; i.e., damaged crops due to excavation and repair equipment and spilled oil; but can continue for years to come as, for example, lower crop yields can occur if contaminated soil is not removed or poor quality soil is used to replace removed soil.

The first person on the scene of a leak, usually the duty foreman, or the maintenance foreman, should evaluate the size of the spill, the approximate flow of oil to the land and look for areas of imminent danger such as residences, main roads, irrigation canals, livestock, etc. If oil flow from the line appears to be low, the mainline station operators should be advised to slow the line to half of its original flow rate. If oil flow is severe the line should be shut down and the section isolated. Gathering lines should also be shut down and isolated until the type and size of leak is ascertained. The spread of the spilled oil should be contained as best as possible until help arrives.

If the leak occurs on farmed land while there is a crop in the field, caution should be exercised to keep land used in making the repairs to a minimum. Clean-up activities should be completed to the satisfaction of the owner or tenant and any removal and disposal of contaminated soil should be coordinated with the owner and the proper regulatory agencies.

Should the leak be in rangeland, care must be exercised to keep grazing livestock out of the spilled oil by fencing out the livestock or dry dirting the spilled oil.

SECTION 4 - SHELL PERSONNEL

NORTHERN DISTRICT

BAY AREA

Name	Title	Address	Home Telephone
J. Freitas	Operations Foreman	15320 Marsh Creek Road Clayton, CA 94517	415/634-1304

CALIOLA/MID

Name	Title	Address	Home Telephone
L. G. Butcher	Maintenance Foreman	655 W. Polk Coalinga, CA 93210	209/935-3168
W. L. Stone	Operations Foreman	653 College Coalinga, CA 93210	209/935-1744

BAKERSFIELD/WASCO

Name	Title	Address	Home Telephone
C. R. Thompson	Operations Supervisor	5709 Logan St. Bakersfield, CA 93308	805/399-3729
J. D. Blanton	Asst.Operns.Foreman	7509 Waldon Bakersfield, CA 93308	805/399-5617
R. W. Holman	Maintenance Foreman	120 Hewlett St. Bakersfield, CA 93309	805/322-1329
B. T. Johnson	District Superintendent	2805 Alberni Way Bakersfield, CA 93309	805/832-5506

SCPI - SRGS/STEELHEAD GAS SYSTEMS

Employee	Office	Home	Answering Service
J. Auld (Jerry)	916/372-2070	916/685-8996	916/372-2070 Alpha Unit #6 Page 21
N. T. George* (Norm)	916/372-2070	916/723-8202	916/372-2070 ALpha Unit #1 Page 12
P. L. Butler (Peggy)	916/372-2070	916/652-0788	916/372-2070 Alpha Unit #3 Page 14
G. W. Dawson (Brentwood) (Greg)	415/634-4922	415/625-2422	415/939-7326 Ideal Unit #4 Page 23
T. H. Weeks (Tom)	916/372-2070	916/777-6328	916/372-2070 Alpha Unit #5 Page 31
B. Lau (Bowman)	916/372-2070	916/989-3372	916/372-2070 Alpha Unit #7 Page 13
D. Spires (Brentwood) (Dennis)	415/634-2124	415/778-4369	415/939-7326 Ideal Unit #8 Page 32
J. Jackson (Jeff)	805/326-5918	805/589-2041	
R. Lane (Bob)	805/326-5590	805/397-8494	

Answering Service is the Key Number - may be contacted at any time.

24-Hour numbers (916) 372-2070 (Alpha Ans. Ser. - Sacramento)
(415) 939-7326 (Ideal Ans. Ser. - Walnut Creek)

*May also be reached thru Delta Answering Service (707) 374-6361, Unit 4514.

SHELL TELEPHONE NUMBERS

BAY AREA

San Jose Plant .... SSN 645-6215 .... 408/262-8200
South San Francisco Plant ...... SSN 645-6212 .... 415/761-1424
So. San Francisco (Meter Stn.) Manifold 415/588-4187
Martinez Pump Station .... SSN 633-3472 .... 415/228-4285
and 646-7946

CALIOLA/MID

Caliola Pump Station .... SSN 646-7417 .. 209/935-2471
Kettleman Pump Station .... SSN 646-7447 .. 209/386-5716
Mid Pump Station .... SSN 646-7737 .. 805/797-2739

BAKERSFIELD/WASCO

Unit Train SACO Loading Site (Bakersfield) 805/392-1150
Bakersfield Pump Station .... (SSN) 646-7717 .. 805/399-1508
Wasco Pump Station .... (SSN) 646-7727 .. 805/746-6200
Midway/Sunset - Wier Pump Station ....(SSN) 646-7731 .. 805/768-4459
Ten Section Pump Station 805/832-4200
Bakersfield District Gaugers .... (SSN) 646-7720 .. 805/399-5595

PIPELINE RADIO UNITS

BAY AREA

BASE STATIONS

Bay Area Answering Service	KRF-667 Control 4
Brentwood	KRF-667 Control 3
Fremont Office	KRF-667 Control 2

RADIO UNITS

Operations Foreman	J. Freitas	22
Mechanic		120K
Gang Truck		21
Line Rider		20
Brentwood Gauger	R. Jenezon	11
Head Pipeliner	F. J. Becerra	2
District Superintendent	B. T. Johnson	19
Corrosion Technician	J. Tully	18

SAN JOAQUIN VALLEY

BASE STATIONS

Bakersfield Pipeline Office	KOI-950 - Control I
Mid Pumping Station	KJB-767
Coalinga Pipeline Office	Control 2
Kettleman Station	WZB-209
Wasco Station	YE-681
Bakersfield Pumping Station	KOI-950 - Control 2
Caliola Pump Station	KDN-883 - Control I

PIPELINE RADIO UNITS

BAKERSFIELD

Operations Supervisor	C. R. Thompson	460
Maintenance Foreman	R. W. Holman	35
Head Roustabout	J. R. Winton	36
Mechanic	C. E. Landrum	101
Electrician	M. E. Newton	107
Gang Truck		54
West Side Gauger	Wes Shuman	115
Mt. Poso Gauger	M. E. Wells	317
Mechanic	J. E. Thorp	389
Ten Section Gauger	Bill Porter	34
Gauger	M. Bringhart	271
District Superintendent		51
Utility Pipeliner		356
Prover Technician	R. H. Warkentin	65
Corrosion Technician	Joe Tully	111
Kern River Gauger	J. Cornett	273
Electrician	Kevin Brock	452
Asst. Operations Foreman	J. D. Blanton	440
Unit Train Gaugers	W. R. Barker - V. C. Garcia	253
Communications Technician	Mike Cox	1
Communications Technician	Don Johnson	?

CALIOLA

Operations Foreman	W. L. Stone	357
Maintenance Foreman	L. Butcher	405
Mechanic	V. R. Brewer	53
Electrician	Ken Ward	49
Head Pipeliner		66
District Gauger Caliola/Coalinga	M. D. Supernaw	47
Gang Truck		79
Utility Maintenance		52
District Gauger - Tulare Field	D. J. Deverick	
Mechanic	R. E. Clark	255
Corrosion Technician	Joe Tully	111
Communications Technician	R. Wohlgemuth	44

SECTION 5 - SHELL EQUIPMENT

EMERGENCY EQUIPMENT

BAY AREA

So. San Francisco Plant:

Marketing Emergency Spill Trailer (See attached list)

San Jose Plant:

Marketing - Emergency Spill Trailer.
40 - Feet 8" X-52 line pipe.

To obtain this equipment, call:

Martinez Pump Station:	(415) 228-4285
W. W. Williams:	(415) 651-5710
J. E. Reece:	(415) 793-1124

PRODUCTS PLANT
OIL SPILL KIT

Pump Off Equipment

1	3 pound plastic hammer
1	MSA Gas analyzer w/PROBE, Model 2A
4	30 gallon trash cans with covers
12	30 gallon size plastic baggies (heavy duty)
2	5 or 10 lb. dry chemical extinguishers
1	3' long trough for draining product through dome into trash cans (0)
1	Air hose adapter for opening internal valves using tire air supply
1	Air drill plus 4 - 3-1/8" bits
1	3" Truck pump out aluminum tube - 8' + long, threaded ell one end
3	Dome lid clamps
1	4" Elbow with male and female camlock fittings
1	3" Elbow with male and female camlock fittings
1	Adapter - 3" male camlock to 4" female
1	4" x 3" Adapter - 4" male to 3" female
1	3" x 2" adapter - 3" male to 2" female
1	2" x 2" adapter - 2" male to 2" male
1	633-AA 4" OPW 4" male to 4" male
1	633-BA OPW 3" female to 2" male
1	4 1/2" Vitraulic to 4" female adapter w/Betts shut of
6	4" OPW female coupler gaskets
6	3" OPW female coupler gaskets
1	634-A 3" OPW dust plug
1	634-A 4" OPW dust plug
1	634-B 3" OPW dust cap
1	634-B 4" OPW dust cap
2	633-A 3" OPW fittings
2	633-F 3" OPW fittings
1	Small roll of thread tape - teflon
1	CO^2 Tank w/90-100 psi regulator, hose and cart
1	5' x 1/2" Brass Rod w/rod driver
2	40' Ground Cables w/clips
1	20' Ground Cable w/clips
1	Rubber grip pad for drilling
5	Tapered wood plugs, 2 1/2" x 3 1/2"
1	6' Aluminum or wooden ladder
4	Chock blocks
4	4" x 4" x 4' blocks
1	Parker Hannifin B/L Adapter #F220 w/gaskets

(O) optional

Communications

1 Radio Telephone in plant pickup
2 Walkie-talkies (O)
1 Bullhorn, battery operated (O)
4 Flasher warning lights or DOT warning triangles
- Traffic cones and flagman stop, slow signs
3 Orange vests
4 Large flashlights
2 Boxes Cyalume light sticks
1 Inexpensive camera, film, etc.
1 List of kit contents for inventory check
1 Copy of plant oil spill contingency plan
1 Amber flasher - cigarette lighter operator

Hand Tools

1 Tool box or small foot locker for all small gear
2 6" blade knives in belt scabbard
2 500' rolls 16 gauge wire
3 Plier wire cutters
6 Pair heavy duty gloves
1 Roll heavy twine
2 Pair straw bale hooks
1 Medical First Aid Kit
2 Clay or soap for plugging small leaks
1 1/2" Drive socket set 7/16 to 1-1/4"
1 12" Crescent wrench
1 8" Crescent wrench
1 1/2" Drive speed handle
1 Combination wrench set 3/8 to 7/8"
1 Vise grips

Cleanup Equipment

2 100' rolls 5' chicken wire
10 6' steel stakes
24 18" wood stakes
1-2 bales straw
3 100 - 3M sweeps, type 126
3 100 each 3M sheets, type 156
3 100 each 3M sheets
1 40' - 3M absorbent boom - type 270
2 Shovels - aluminum, long handle
2 Sledge hammers
1 Axe
1 6' Prybar
2 Long handle rakes
2 6" x 8' culvert pipes
- Rags, hand towels, hand cleaner and skin cream
1 Pushbroom
1 Squeegie
1 Gallon - Oil Herder with hand sprayer
2 - 100' - 1/2" rope
2 Long handle hooks (telescope handles)
1 Swimming pool skimmer
2 Sets chest high waders & 4 low boots
2 Life vests
6 Rain suits - yellow

Miscellaneous

1 Trailer to haul kit to spill site (hitches on pickups to tow)
6 Hard hats & face shields
6 Splash goggles
4 Spare coveralls, sweat shirts and pairs of socks
1 5-gallon drinking water can
2 Dozen drinking cups
1 Catering service to bring coffee and food to accident scene
- Personal toilet kits
1 Trailer cover (Camper Shell)

Supplemental Equipment

Heavy duty wreckers with boom
Vacuum trucks
Earth mover (dozer, front end loader)
Boston Whaler type boat with motor on trailer (O)
Aluminum pram with small motor (O)
Skimming devices with fittings (O)
Suction hose
Discharge hose
Floatation boom (O)
Portable generator and lights (O)
2" Homelite gas pump, spark retarded (O)
Small chain saw (O)
Portable foam generating kit (O)

EMERGENCY EQUIPMENT - FREMONT AREA

1 - 10,000 GVW tandem axle oil spill trailer equipped with 13-ft. aluminum boat & 9½ HP Evinrude outboard motor.
1 - Half-ton pickup with 2-way radio.
1 - One-ton mechanic truck with arc welder, gas cutting & welding equipment, winch, and 2-way radio.
1 - One-ton electrician truck with winch and 2-way radio.
1 - Zeus portable electric generator - 1500 kw.
1 - Detection "505" pipe locator.
3 - Hudson sprayers.
1 - Beaver pipe cutters 6" - 8".
1 - Ellis-Ford pipe cutters 4" - 12".
6 - Barricades.
3 - Light stands with lights.
200 - Feet heavy-duty drop cord, three-prong outlet.
2 - Watermaster skimmers, pumps, and plastic pipe.
6 - Weld + ends, 2 - 8", 2 - 12".
\- Assorted half sole.
18 - Chain clamps.
300 - Feet assorted pipe.
1 - 2" Homelite self-priming pump - 100 gpm.
1 - 3" Homelite self-priming pump - 150 gpm.
1 - 2" Fairbanks Morse self-priming pump - 75 gpm.
10 - Split sleeves, 2 - 8", 8 - 10".
6 - Smith clamps, 2 - 8", 2 - 10", 2 - 12".
2 - Bird scarers.
1 - Explosimeter.
1 - Bonding wire and cad-weld.
1 - Homelite blower (aspirator).
28 - Fiberperl pillow bags - makes 50' boom.
10 - Bags loose fiberperl.
100 - Feet 3" hose.
50 - Feet 2" hose.
1 - Roll of stucco wire.
400 - Feet 3/4" manila rope.
400 - Feet 1/2" manila rope.

To obtain equipment, contact:

Wendal Williams	(415) 651-5710
John Reece	(415) 657-4606

SAN JOAQUIN VALLEY
BAKERSFIELD

1	-	5/8 ton utility pickup with 2-way radio
1	-	One-ton head roustabout truck with 2-way radio and misc. tools
1	-	One-ton mechanic truck with 2-way radio and portable arc welder, winch
1	-	3/4-ton electrician truck with 2-way radio and winch
1	-	3/4-ton pickup with 2-way radio
2	-	1/2-ton pickups with 2-way radios
1	-	2-ton truck with A-Frame, 2-way radio, misc. tools and clamps for line sizes 2" through 18"
1	-	Jaeger 150 CFM single axle mounted
1	-	Water master skimmer pump and hoses
1	-	12-foot aluminum boat and 9-1/2 Evinrude outboard motor
1	-	Goldlock pipe locator
1	-	Model G sniffers
6	-	Reed pipe cutters, 2" thru 14"
1	-	1500 Watt portable electric generator
8	-	Chain clamps
4	-	Bonding wire clamps
5	-	Pair rubber hip boots, sizes 8 through 12
4	-	Hudson sprayers, two 2-gal, and two 3-gal.
	-	Various sizes of pipe - 3" through 14", half-sole
	-	Cleaning solvent , 100 gal.
1	-	Neoprene sheet gasket material
	-	Portable fence w/metal posts, 1000-feet
	-	Miscellaneous hand tools, shovels, picks, rakes, and pitchforks

CALIOLA

1	-	10,000 GVW Tandem Axle Oil Spill Trailer equipped with 12-foot aluminum boat and 9-1/2 HP Evinrude outboard motor
2	-	Half-Ton pickpups with radios
1	-	3/4-ton pickup with 2-way radio
1	-	One-ton mechanic truck with arc welder, gas cutting & welding equipment winch lift, and 2-way radio
1	-	3/4-Ton electrician truck with winch lift and 2-way radio
1	-	2-1/2_-ton truck with 5-ton hydracrane, 2-way radio and misc. tools
1	-	Air compressor with tools
1	-	Honda portable electric generator - 15w
2	-	Pipe locator
3	-	Reed pipe cutters 2" - 14" pipe
1	-	Allison pipe cutters for 18" - 20" pipe
4	-	Barricades
2	-	Light stands with lights
1	-	Watermaster oil skimmer with pump and hoses
1	-	Dynamation gas sniffer
1	-	Bonding wire and cad weld unit
2	-	Bird scarers
1	-	Chain saw
1	-	Stopple equipment for 8", 10", 12", 14" pipe
	-	Assorted hand tools
2	-	Homelite water pumps (150 & 192)
1	-	Drop Cord - Heavy duty with 3-prong end

CALIOLA (Cont'd)

1	-	150' of canal boom with two metal platforms
1	-	Tandem wheel trailer for hauling - flatbed
12	-	Bales of excelsior
2	-	14" weld plus end
5	-	Telephone poles, approx. 35-ft. long
2	-	14" Smith clamps
2	-	Spools, with some wire cable
	-	Pipe, assorted sizes, 8", 10", 14" and 18"

ABOVE EQUIPMENT MAY BE OBTAINED BY CALLING:

Caliola Pump Station 209/935-2471
8:00 a.m.-4:00 p.m.

Caliola Operations Foreman, Bill Stone...209/935-1744

Kettleman Pump Station 209/386-5716
On-duty Station Engineer

SECTION 6 - OUTSIDE COMPANIES

BAY AREA

ARCO - Richmond	415/234-2181
(24-Hr.)	415/236-0313
Exxon Oil Company - Benecia	707/745-7011
Getty Oil Company - Coalinga	209/935-2021
- Concord	415/687-9430
Tosco Refinery - Martinez	415/228-1220
Southern Pacific Pipe Lines - Los Angeles	213/624-9461 (Ext. 22148)
Products Line - Richmond	415/233-2027 or 233-7301
Products Line - Concord	415/682-6850
Products Line - Brisbane	415/467-8107
Pipelines - Roseville	916/624-2431 or 624-2432
Products Line - San Jose	408/262-3417
Standard Oil Company of California - Pittsburg	415/432-7598
Refinery, Richmond	415/620-3000
Pipelines	415/432-7590
Standard Pacific Pipelines - Antioch	415/757-8579
Texaco, Inc. - Richmond	415/232-7671
Time Oil Company - Richmond	415/232-7447
Union Oil Company of California	
Crude Oil - Los Angeles	213/977-7600
Oleum Refinery - Oleum	415/799-4411
Pipelines - Avenal	209/386-9428

SAN JOAQUIN VALLEY

ARCO	213/435-1371
Beacon Oil Company	209/582-0241
Getty Oil Company	209/935-2071
Golden Bear Company	805/399-7110
Kern County Refining	805/845-0761
Mobil Oil Company	213/775-6613
So. Calif. Gas Co.	209/732-7961
So. Pacific Pipe Lines	213/624-9461
Standard Oil Company	805/399-0651
Sunland Refining	805/589-9615
Texaco	805/323-4213
Union Oil Company	213/977-7766

SECTION 7 - GOVERNMENTAL AGENCIES

The following agencies are to be notified in the event of occurrence of the category of incident shown as requiring notification:

FEDERAL
(Both Bay Area and San Joaquin Valley)

U. S. COAST GUARD

1. Twelfth District 415/437-3073
2. Rescue Coordination Center 415/437-3700

Notify above if there is a possibility that the spill will enter navigable waters.

U. S. DEPARTMENT OF TRANSPORTATION

Notify by telephone...... 800/424-8802..... if the emergency causes:

1. Death or personal injury requiring hospitalization.
2. Fire or explosion.
3. Estimated damages in excess of $5,000.
4. Water pollution.
5. Emergency was significant even though not including any of the above.

Telephone report should include the following information:

1. Name and address of operator.
2. Name and telephone number of the reporter.
3. Location of emergency.
4. Time of emergency.
5. Fatalities and personal injuries, if any.
6. All other significant facts known that are relevant to the cause of the emergency and extent of damage.

NOTE: Such facts will necessarily be limited until the cause and damage extent have been actually determined.

U. S. ENVIRONMENTAL PROTECTION AGENCY
In all cases of pipeline leaks 800/424-8802

U. S. CORPS OF ENGINEERS............................ 415/974-0355
If spill is in navigable waters.

U. S. FISH & WILDLIFE.............................. 707/944-4460
If spill is in water or game preserve.

BAY AREA ONLY

STATE AGENCIES:

STATE RESPONSE CENTER.......................... 800/852-7550 (24 Hrs.)
Will notify all state agencies

CALIFORNIA STATE FIRE MARSHAL .... 916/427-4158 (24 Hrs.)
Note: All leaks or spills to be reported

STATE DEPARTMENT OF FISH & GAME
Sacramento 916/452-4981

Notify of all water spills in game preserve.

CALIFORNIA HIGHWAY PATROL
Ask Operator for ZE-12000

Notify in event of major spills in vicinity of freeways, state highways, or if local assistance is needed.

LOCAL AGENCIES

DEPARTMENT OF PUBLIC HEALTH
Alameda County 415/874-6794
Contra Costa County 415/372-2286
Santa Clara County 408/299-2507
San Joaquin County 209/466-6781
San Mateo County 415/573-2222
Stanislaus County 209/531-5341

Notify of spills in populated areas of county under their jurisdiction.

COUNTY SHERIFF

Alameda County	415/351-2020
Contra Costa County	415/228-8280
Santa Clara County	408/294-1334
San Joaquin County	209/944-2181
San Mateo County	415/364-1811
Stanislaus County	209/571-6569

COUNTY FIRE DEPARTMENTS

Alameda County	415/351-2020
Contra Costa County	415/228-8280
Santa Clara County	408/294-1334
San Joaquin County	209/944-2118 209/944-2119
San Mateo County	415/364-1811
Stanislaus County	209/571-6569

Note: All line leaks are to be reported to the Fire Department having jurisdiction.

CITY FIRE DEPARTMENTS

Martinez	415/933-1313
Pleasant Hill	415/933-1313
Lafayette	415/933-1313
Moraga	415/376-4421
Rheem Valley	415/376-4421
Oakland	415/444-1616
South San Francisco	415/873-3333
San Francisco Airport	415/761-0800
Oakland Airport	415/577-4000
San Leandro	415/638-2121
Hayward	415/581-3636
Fremont	415/793-3434
Union City	415/471-1441
San Jose	408/294-4664

Note: All line leaks are to be reported to the Fire Department having jurisdiction.

CITY POLICE DEPARTMENTS

Martinez	415/288-4141
Pleasant Hill	415/680-7000
Lafayette	415/284-5010
Moraga (Contra Costa County Sheriff)	415/376-0286
Rheem Valley (Contra Costa County Sheriff)	415/376-0286
Oakland	415/273-3211
South San Francisco	415/873-3333
San Francisco Airport (San Mateo Co. Sheriff)	415/364-1811
Oakland Airport (Alameda County Sheriff)	415/351-2020
San Leandro	415/638-2123
Hayward	415/784-7000
Fremont	415/796-3311
Union City	415/471-1441
San Jose	405/297-3565

SAN JOAQUIN VALLEY

STATE AGENCIES

STATE RESPONSE CENTER .... 800/852-7550 (24 Hrs.)
Will notify all state agencies. or 916/421-4341
or 916/427-4990

CALIFORNIA STATE FIRE MARSHAL ....916/427-4158 (24 Hrs.)
Note: All leaks or spills to be reported.

FISH & GAME DEPARTMENT
Bakersfield ....(Capt. Bob Allen) 805/871-2055
Fresno 209/222-376
Notify if water spill or land spill involving game preserve.

CALIFORNIA HIGHWAY PATROL
Ask Operator for .... ZEnith 12000

Notify if major spills in vicinity of freeways, state highways or if local assistance needed.

DEPARTMENT OF WATER RESOURCES
Project Operations Control Center 916/455-3920
South of Kettleman (24 Hrs.) 805/858-2211
Fresno 209/884-2405

LOCAL AGENCIES

DEPARTMENT OF PUBLIC WORKS
Fresno County 209/453-5168
Kern County 805/861-2481
Kings County 209/582-3211
Merced County 209/385-7421
Notify if spill in populated area of County under their jurisdiction.

COUNTY SHERIFF
Fresno County 209/488-3939
Coalinga .... Ask Operator for Enterprise 11329
Fresno 209/488-3939
Merced County 209/385-6891

Kern County

Bakersfield 805/327-3392
Wasco... 805/758-5166

Kings County

Hanford 209/584-9276

COUNTY FIRE DEPARTMENTS

Fresno County

Coalinga 209/935-1323
Huron 209/945-2311
Dispatcher (Sanger) 209/268-6488

Kern County

Bakersfield 805/324-6551

Kings County

Avenal .... 209/386-5555 or
386-9582
Kettleman City 209/386-5338
(If no answer call 209/386-9582)

Merced County 209/385-6891

SECTION 8 - CONTRACTORS

BAY AREA

BAY CROSSING LEAK

Astrocopters Ltd. (24 Hour Service) 415/635-6880
(Oakland International Airport)

Podesta Divers Inc. (24 Hour Service) 415/495-3955
Pier - The Embarcadero
San Francisco, California 94111

Healy Tibbit Construction Co.
(24 Hour Service Number) 415/222-6083
411 Brannan Street, San Francisco, Calif. 94107 .... 415/781-7268
Contact Mr. Jarvas Gates.
Have required equipment to raise the line if necessary.

CONTRACTORS

MGM Construction Co. - Concord 415/685-8812
Call First - Ben Castro 415/820-4455
Jeff Lowe 415/939-9491

ARB, Bakersfield 805/831-7575

Straightline, Rio Vista (24 Hour Service) 707/374-6110
Dennis Birdsell, Home Phone 916/776-1946

VACUUM TRUCKS

Industrial Tanks Co. - Martinez 415/228-5100
18 trucks - 110 bbls. to 36 bbls.
For Spills Call 800/262-1900
Universal Industrial Services Inc.
620 Wilbur Avenue, Antioch, Calif. 94509
140 bbl., 3 - 130 bbl., 80 bbl.

Asta Construction Co. - Rio Vista (24 Hour) 707/374-6351
8 trucks - 110 lbs. to 45 bbls.
Loaders, dumps, dozers & low boys.

Concord Crane & Rigging, Martinez (24 Hour) 415/682-1870
60 bbls. and 6 - 110 bbls.

MISCELLANEOUS

Flasher Company - Oakland 415/836-0861

First Aid, signs, fire extinguishers, tools

Paco Pacific Pump Company, Oakland (24 Hour) 415/562-5628
or 415/639-3200

ELECTRICAL CONTRACTORS

Broadmoor Electric - San Leandro 415/483-2000
Rubin White 415/656-3246

Able Electric - San Jose 408/297-7897
Ken Anderson 408/842-8892

SAN JOAQUIN VALLEY

PIPELINE CONTRACTORS

ARB, Inc. - Bakersfield	805/831-7575
Reed Smith	805/831-0270
Ed Hunt	805/831-6072
Jeff Pratt	805/832-6618
Brian Pratt	805/833-9608
O'Meara & Rogers Const. Co. - Bakersfield	805/327-7271
Oil Field Constr. Co. - Bakersfield	805/327-7977
Oil Field Constr. Co. - Taft	805/765-7997
P. M. Scrivner, Inc. - Bakersfield	805/589-3885
Coalinga	209/935-0815
Burnett Constr. Co. - Coalinga	209/935-0721

VACUUM TRUCKS

L. W. Potter Company - Bakersfield	805/589-4320 (24 Hr.)
McKay Trucking Company - Coalinga	209/935-0851
M. P. Oil Co. - Bakersfield	805/393-1151 (24
Petrol Transportation Inc.	805/393-6514

COOPERATIVES

Clean Bay Inc.
2070 Commerce Avenue
Concord, California 94520

Phone: 415/685-2800 (24 Hrs.)
J. R. Mortenson, Manager

EQUIPMENT

Contingency Plan
Generator
Scottair Paks
Blowers
Ejectors
Diaphragm Pumps
Centrifugal Pumps
Night Lights
J. W. Testers (2)
Sorbents
Boom
Metal Detectors
P. D. Williamson Stopples
Plico - Pipe Couplings
Tools
Foam & Applicator
Barricades & Flashers
Scrapers/Ball
Hot Tap Equipment
Air Compressor
Welding Machine
Aluminum Boats

Clean Coastal Waters
Mexican Border to Point Dume
302 W. Fifth, Suite 302
San Pedro, CA 90731

213/833-4426 (24 Hrs.)

Clean Seas, Inc.
Point Dume to Estero Bay
7127 Hollister Avenue
Goleta, CA 93108

805/968-1005

SECTION 9

TRAINING

All operating and maintenance personnel shall be instructed in the following emergency procedures:

1. Carry out the operating and maintenance, and emergency procedures that relate to their assignments.

2. Know the characteristics and hazards of the commodities transported.

3. Recognize conditions that are likely to cause emergencies, predict the consequences of facility malfunctions or failures and commodity spills, and to take appropriate corrective action.

4. Take steps necessary to control any accidental release of commodity and to minimize the potential for fire, explosion, toxicity, or environmental damage.

5. Learn the proper use of firefighting procedures and equipment, fire suit, and breathing apparatus by utilizing, where feasible, a simulated pipeline emergency condition, and

6. In the case of maintenance personnel, to safely repair facilities using appropriate special precautions, such as isolation and purging, when highly volatile liquids are involved.

Personnel performance in meeting the objectives shall be reviewed once a year and any changes necessary to maintain its effectiveness shall be made.

TANK TRAIN CALL TREE

FOR

DERAILMENTS/OIL SPILLS

SOUTHERN PACIFIC OR OTHERS

CHEMTREC

800-424-9300

SHELL EMERGENCY RESPONSE SYSTEM

SHELL ANAHEIM CONTROL CENTER

714-991-9561

714-520-3711

BAKERSFIELD (1) (3)

STATION OPERATOR - OFF. 805-399-1508

JIM BLANTON - OFF. 805-399-5595
HOME-805-399-5617

CHUCK THOMPSON - OFF. 805-399-5595
HOME 805-399-3729

CARSON (1) (3)

SHIFT FOREMAN - OFF 213-513-7484

BOB HARLOCKER - OFF. - 213-513-7441
HOME -

MANNY PEGUERO - OFF. - 213-518-5880 #5342
HOME -

ANAHEIM PIPE LINE (1)

STEVE HERRINGTON - OFF. 714-520-3777
HOME 714-826-6044

DICK HAUPTMANN - OFF. 714-520-3748
HOME 213-421-3603

JUAN MENDOZA - OFF. 714-520-3745
HOME 714-777-6112

JOHN HITE - OFF. 714-520-3741
HOME 714-380-9334

ANAHEIM CRUDE SUPPLY (1)

BOB MINUS (2) - OFF. 714-520-3515
HOME 714-970-2055

JOE DAVIS - OFF. 714-520-3516
HOME 714-598-3900

HANK BABUSZCZAK OFF. 714-520-3510
HOME 714-961-1396

NOTES

ML8524901

1. Personnel available to assist Shell Emergency Response System
2. Responsible for decision 48-cars train
3. Notifies appropriate Head Office Management

APPENDIX C

COUNTY-SPECIFIC DESCRIPTIONS

C.1 Geology

C.2 Soils and Soil Features Maps

C.3 Surface Water

C.4 Socioeconomics and Transportation

C.5 Land Use and Land Use Features Maps

C.1 GEOLOGY AND TOPOGRAPHY

Kern County

The Kern County segment of the proposed route is located along the western border of the San Joaquin Valley, within the Midway Valley, McKittrick Valley, Antelope Plain, and Lost Hills. Topographically, the land varies from dissected uplands near the southern terminal point at Weir station to low alluvial plains and fans in the central and northern area of the county. Elevations in Kern County along the proposed route decline steadily from 1,550 feet above sea level at milepost 0, to 300 feet above sea level at the Kern-Kings County border.

From the pipeline's southern terminus in the Midway-Sunset oil field, south of McKittrick, north to the intersection of State Highway 33 and Lokern Road, the topography consists of low, eroded hills and smooth alluvial valleys. A short section of the proposed route near McKittrick (approximately mileposts 5.5 to 7.0) is underlain by undifferentiated consolidated and semi-consolidated sedimentary rocks of marine origin, primarily sandstone and shale of upper Miocene age. Aside from this, most of the region is underlain by the Tulare Formation, which consists of old stream deposits. These deposits are primarily poorly consolidated sand and gravel with lenses of gypsum-bearing sediment. The Tulare Formation originated from streams that emerge from the adjacent Temblor Range. They have been slightly warped by earth movements, and are overlain by recent alluvium.

From milepost 12, the proposed route traverses the gently sloping alluvial surface of Antelope Plain. The area is underlain by recent alluvial fan deposits. These thick alluvial deposits form an extensive belt of alluvial fans covering the western portion of Kern County.

From the point where the proposed route crosses Route 5 along the eastern side of the Lost Hills to the Kern County border, the alluvial deposits are in poorly defined gradational contact with unconsolidated flood basin sediments. The sediments were deposited under sluggish floodwater or lacustrine environments, and are composed primarily of silt, clay, and fine sand.

Overall, the potential for encountering significant geologic resources along the proposed route in Kern County is low. However, within the Tulare Formation and the alluvial deposits there is the possibility of encountering commercial sand and gravel deposits.

Kings County

The section of pipeline that traverses Kings County encounters geologic conditions similar to those in the northern section of the route through Kern county. Topographically, the southern portion of Kings County is an area of low relief with slopes of 1 to 2% on the south side of the former Tulare Lake. This plain extends to approximately milepost 56. From milepost 56 to the Fresno County line, the topography gradually rises to an area of dissected alluvial fans along the east side of the Kettleman Hills uplift.

Near-surface sediments underlying the southern portion of the route consist primarily of recent sediments deposited during flood stages of the major streams in the area between natural stream levees and alluvial fans.

The basin sediments are gradational with underlying shallow semi-consolidated sediments (silty sands enclosing lenses of coarse sand and gravel) of the Tulare Formation near the foothills region of the Kettleman Hills.

North of Kettleman City, the proposed route encounters an area underlain by alluvial deposits interfingered with older mudflow deposits from the Kettleman Hills. The sediments consist primarily of moderately to poorly sorted, poorly stratified gravels, and fine to coarse sands.

Commercial sand and gravel deposits may exist within the Tulare Formation and the alluvium, although none are presently being exploited.

Fresno County

Within western Fresno County, the proposed pipeline is routed along the eastern border of the Kettleman Hills and the Diablo Range. Most of the proposed route follows an existing pipeline right-of-way from the Fresno-Kings County border north to the Caliola station through an area characterized by broad alluvial fans of low relief. North of Caliola station to Little Panoche Creek, the proposed route passes in and out of the foothills region of the Diablo Range and adjoining alluvial fans. From Little Panoche Creek north to the Fresno-Merced County line, the proposed route parallels an existing power line right-of-way through an area characterized by steep slopes and narrow valleys in Cretaceous sediments of the Laguna Seca Hills.

From the Fresno County border north to the Caliola station, the geologic setting is primarily unconsolidated alluvial and floodplain deposits. These deposits vary from coarse-grained sands and gravels to fine-grained sands and silts. Along the eastern edge of the North Dome in the Kettleman Hills, close to where the pipeline crosses Vadose Creek, there is a sand and gravel mining operation. This indicates a potential for commercial resources to extend into the pipeline right-of-way.

North of the Caliola station to Little Panoche Creek, the proposed route is underlain by alternating Plio-Pleistocene alluvial fans, alluvium, and consolidated and semi-consolidated shale, sandstone, and mudstone, which are Pliocene non-marine deposits of the foothills. A sand and gravel operation is located approximately 1,000 feet to the east of the proposed pipeline route at Cantua Creek. The potential for similar geologic resources occurring along the pipeline right-of-way exists here and at the Panoche Creek crossing to the north.

Past Little Panoche Creek to the Merced-Fresno County border, the proposed route crosses Quaternary unconsolidated terraces for approximately 1 mile and then upper Cretaceous sandstone, shale, and conglomerate of the Panoche Formation.

Apart from the sand and gravel areas, no significant economic geologic resources of potential economic value are expected to occur along the proposed route.

Merced County

In southwestern Merced County, the proposed route encounters an area of more rugged terrain, steeper slopes, and narrow valleys known as the Laguna Seca Hills. Elevations range from approximately 800 feet above sea level in the valleys, to over 1,100 feet above sea level on the ridge tops.

From milepost 139 to milepost 143, the route traverses Panoche Formation and the alluvium of Wildcat Canyon. There is a brief stretch of Tulare Formation near Laguna Seca Ranch (mileposts 143 to 144) and then further shale sandstone and conglomerate of the Panoche Formation to milepost 146 where the route enters the alluvium of Ortigalita Creek for 2.5 miles. North to milepost 152.5, the topography is dominated by a flattened dissected area of alternating Panoche and Tulare Formation, and then the route crosses the gravel and sand of the Los Banos Creek alluvium.

South of the San Luis Reservoir, along the O'Neill Fault zone, the proposed route passes through the upper Cretaceous Great Valley Sequence, consisting of micaceous shale interbedded with sandstone and pebbly to cobbly conglomerates. The rock units consist mainly of rippable material, but some areas may require blasting where hard sandstone ledges are encountered.

At State Route 514 (milepost 159), the pipeline route turns north and is underlain by sands and gravels of the Tulare Formation until it crosses the California Aqueduct (milepost 160) and enters the alluvium below the San Luis Reservoir and O'Neill Forebay. The route exits alluvium after crossing Romero Creek and again enters an area of Panoche Formation bedrock extending for a short distance either side of the Quinto Creek alluvium at Howard Ranch. From milepost 170 to the Stanislaus County border, the geology consists predominantly of sands and gravels of the Tulare Formation.

Apart from the potential sand and gravel areas noted along the proposed route in Merced County, no significant geologic resources are known to exist along this segment of the pipeline.

Stanislaus County

From the Merced County line, the route parallels U.S. Highway 5 and the California Aqueduct system, crossing Stanislaus County in a north-northwesterly direction. The predominant surface geology is of Tertiary age and consists of shale, sandstone, and siltstone. The northwest corner of the county is underlain by upper Cretaceous shale and siltstone, interbedded with minor amounts of sandstone. The route traverses steeply dissected hills in the southwestern portion of the county. It also traverses some narrow alluvial fans and terraces consisting of unconsolidated sediments.

At the Merced County line, the proposed route traverses a broad alluvial fan of unconsolidated material associated with the Whitney Canyon and Garzas Creek outlets. The route continues into steep dissected hills at Bennett Valley. The surface geology in this area consists of sandstone, shale, and siltstone of Tertiary age.

At Orestimba Creek, the proposed route traverses exposures of shale and siltstone as well as unconsolidated alluvial sediments in the creek bottoms. The route continues north into the Crow Creek area, which has similar surface geology.

From Crow Creek, the proposed route traverses Little Salado Creek and Salado Creek, whose stream channels and floodplain contain fluvial and colluvial sediments. The dissected hills north of Salado Creek consist of siltstone and sandstone bedrock. Some upper Cretaceous shale is exposed south of Del Puerto Creek, but only for a short distance in outcrops along the ridges. At Del Puerto Creek, the proposed route traverses terrace deposits.

From Del Puerto Canyon, the proposed route approaches and parallels U.S. Highway 5 and runs along the eastern edge of the foothills. The route traverses alternating sequences of unconsolidated alluvial sediments including alluvial deposits from the Ingram Canyon outlet and other smaller outlets until it reaches the San Joaquin County line.

The majority of the pipeline segment through Stanislaus County is underlain by deposits of sandstone, siltstone, and shale. Most of these units consist of friable deposits. The remainder of the route through this county is underlain by unconsolidated alluvial deposits.

San Joaquin County

From the Stanislaus County line, the proposed route runs along side U.S. Highway 580 and parallels the California Aqueduct for much of the distance (milepost 201.5 to milepost 216) across the southwestern corner of San Joaquin County to the Alameda County line.

The predominant surface geology along the proposed route through San Joaquin County consists of Tertiary age sandstone and shale with interbeds of tuff and conglomerate and fans, terraces, and valley fills of unconsolidated or semi-consolidated alluvial sediments.

Approximately 4 miles of this 18-mile segment consists of rippable rock. The remainder comprises alluvial sand and gravel deposits.

Alameda and Contra Costa Counties

From the San Joaquin County line, the route runs northwest across the northeast corner of Alameda County and continues northwest across Contra Costa County to a point due south of Antioch near the Antioch Airport and the Contra Loma Reservoir, where it turns and runs generally west to Martinez.

Across Alameda County and in Contra Costa County, as far as Antioch Airport, the surface geology along the route consists of upper Cretaceous and Tertiary shale and sandstone. Sandstone is found close to the Contra Loma Reservoir with minor amounts of tuff, shale, and clay. This section of the route traverses several broad alluvial fans, terraces, and valley fills, especially from Kellogg Creek north, including the outlets of Marsh Creek, Deer Creek, and Sand Creek. Approximately 10 of the 22 miles of this section of the route consist of unconsolidated sediments; the remainder consists of rippable deposits. Some sandstone outcrops may require blasting.

From Antioch Airport west to Martinez, the proposed route crosses steep dissected hills along the northern margin of the Diablo Range consisting of Tertiary sandstone, shale, tuff, and, in one place, conglomerate, with shallow soils and outcrops of bedrock. South of Antioch to the Kirker Pass Highway south of Pittsburg (approximately 7 miles), the surface deposits consist of sandstones with tuff interbeds. Beyond Kirker Pass Highway, similar conditions prevail for about 5 to 6 miles, to the Arnold Industrial Highway, with the addition of a short (less than 1 mile) section of Pliocene conglomerate.

From the Arnold Industrial Highway to the Sacramento Northern Railroad (approximately 4 miles), the route is underlain by sandstone, shale, clay, and volcanic tuff. Exposures of rock ranging from the Eocene Kreyenhagen Formation to the Pliocene Wolfskill Formation are common on ridge spurs and stream cuts. For about 6,000 feet after crossing the Sacramento Northern Railroad, the proposed route passes through a marshy area less than 10 feet above sea level forming part of the delta of the San Joaquin and Sacramento rivers. Similar conditions are encountered for a short distance (400 feet) at the head of Hastings Slough and while crossing the floodplain of Pacheco Creek and Walnut Creek (3,500 feet wide). The remainder of this part of the route (some 8,000 feet), extending to the pipeline's terminus at the Martinez refinery, is on low spurs of shale and sandstone bedrock and older alluvium reaching north into the recent delta sediments.

The areas of sand and gravel deposits traversed by the pipeline route from approximately milepost 230 to approximately milepost 238.5 are identified as a sand and gravel resource area in the California Department of Natural Resources, Division of Mines and Geology, Special Report 146, 1983. No other probable economic mineral resources were noted in Contra Costa County that would be impacted by the proposed pipeline.

C.2 SOILS AND SOIL FEATURES MAPS

(Maps showing soil features are included at the end of this section. The legends to these maps summarize soil constraints.)

Kern County

The soils encountered by the proposed route in Kern County range from the saline-alkali San Joaquin Valley floor soils, to the steeply sloped upland soils of the Temblor Hills. Upland areas are used mainly as rangeland, with the most rugged areas best suited to wildlife habitat. Very steep slopes (>50 to 75%) and erosion hazard are the main usage limitations. Soils on the alluvial fans, plains, and terraces are used primarily for irrigated crops and rangeland, with few usage limitations. The valley floor soils consist of sandy loams, clayey loams, and loams with moderate to strong saline-alkalinity. These areas are used for irrigated salt-tolerant crops, rangeland, irrigated pasture, and wildlife habitat. Salinity and poor drainage are the primary usage limitations.

In the area of the McKittrick station (mileposts 5 to 12), the proposed route encounters low though sometimes steeply sloping hills. These areas pose a moderate to high erosion hazard. The potential for impacts to soils in these areas is mitigated by the fact that the dominant land use is oil fields characterized by a considerable amount of previous soil disturbance. East of the Lost Hills area, the proposed route crosses irrigated croplands. Crop productivity will be affected by horizon mixing and unmitigated compaction in this area during pipeline construction.

From milepost 36 to the Kings County line, the proposed route encounters soils with moderate to strong saline-alkalinity. Saline horizon mixing with topsoil and ponding will interfere with the reestablishment of salt-tolerant vegetation.

Kings County

The soils encountered by the proposed route in Kings County range from the nearly level San Joaquin Valley basin rim soils, to the moderately steep slopes of the Kettleman and Kreyenhagen Hills. The sandy loam and clayey loam soils of the alluvial fans and basin rim are used mainly for irrigated row and field crops. Saline-alkalinity is the major usage limitation, requiring saline-alkali-tolerant crops. Poor soil drainage in most areas causes ponding of runoff. The loam and sandy loam soils of the moderately sloping to moderately steep hills are used primarily for rangeland and wildlife habitat. Much of the area is somewhat excessively drained; soils are shallow on steeper slopes; and the erosion hazard in disturbed areas is high.

From the Kern County line to milepost 49 in Kings County, the proposed route traverses saline-alkali rangeland. Saline-alkalinity (possibly increasing with depth) and ponding runoff could affect right-of-way revegetation in this area. A 10-mile segment of the route (from mileposts 49 to 59) crosses highly productive irrigated croplands as well as smaller areas of irrigated pasture. Horizon mixing during construction could reduce crop productivity in this area.

The proposed route crosses the moderately steep slopes of the extreme eastern edge of the Kettleman Hills between mileposts 60 and 70. Slopes associated with intermittent drainage valleys pose a moderate but significant erosion hazard. Accelerated soil erosion will hinder revegetation efforts and will result in accelerated sedimentation to adjacent irrigated pastures and croplands.

Fresno County

Soils occurring along the proposed route in Fresno County range from the gently sloping alluvial fan and terrace soils in the foothill regions, to the upland soils of the Blue, Tumey, Panoche, and Ciervo Hills. Gently sloping alluvial fan soils are prime soils for irrigated crops. Terrace soils, which range from nearly level to strongly sloping (9 to 15%), are used primarily for irrigated and non-irrigated crops and annual rangeland. In some areas, poor drainage in the more clayey soils and a slight erosion hazard in sandier loams are the main usage limitations.

Loams, clay loams, and sandy loams occur on the moderately steep to steep hillsides in the foothill areas. Spring and winter grazing is the predominant land use. Erosion hazard ranges from moderate to very high for most of the Blue, Tumey, and Panoche Hills areas, and is very high on the north slope of the Guijarral Hills.

Sections posing the greatest erosion hazard include the area from mileposts 87.5 to 92 in the Big Blue Hills and the footslopes of the Ciervo Range from mileposts 101.5 to 106.5. Shallow soil conditions may be encountered on hilltops and the steeper side slopes. A more moderate but significant erosion hazard is encountered in the area north of Little Panoche Creek between Salt and Wildcat canyons.

Areas of soils with low permeabilities, which interfere with revegetation, will be encountered by the proposed route where it traverses clayey terrace and alluvial fan soils. These soils are prone to water erosion on steeper grades. Identification of these areas is difficult since they have never been surveyed by the USDA SCS.

In area of irrigated cropland soils--between Panoche and Little Panoche creeks, and from the Kings County line to milepost 85--horizon mixing can adversely affect cropland productivity. These croplands are prime agricultural lands, and a spill here would result in a highly significant, short-term impact.

Merced County

Soils along the proposed route in Merced County range from the very deep alluvial fan and terrace soils found along the base of the eastern footslopes of the Diablo Range, to the steeply sloped foothill soils of the Diablo Range.

The route crosses strongly sloping to very steep upland soils consisting of calcareous loams, clayey loams, and silty loams. These soils are primarily used for annual rangeland and wildlife habitat, though some moderately sloping areas may be cultivated. A moderate to high erosion hazard and low water capacity are the main usage limitations. Because of the high erosion potential, restoration and revegetation efforts in these areas will be difficult. In addition, excess lime content in some surface and subsurface soils and poor drainage may affect revegetation efforts.

Areas crossed by the proposed route that are highly erosion-prone include the steep ridges and hillsides southeast of the proposed Ortigalita Creek crossing; the steep slopes leading in and out of the Salt Creek Valley; the slopes north of the Los Banos Reservoir; the steep slopes associated with the proposed crossing of the unnamed tributary near milepost 153; and the extremely steep slopes encountered at the proposed site of microwave tower No. 10. A somewhat more moderate but significant erosion hazard exists in the tributary areas of Wildcat and Salt canyons near the Fresno County line.

The nearly level to gently sloping soils of the alluvial fans consist of loams, clayey loams, sandy clayey loams, and clays. Most areas are well-drained and are considered to be excellent irrigated cropland. Some clay soils have low permeabilities and may cause ponding of runoff. The terrace soils consist of nearly level to strongly sloping calcareous clayey loams and clayey loams. Irrigated and non-irrigated crops, annual rangeland, and recreation are the main land uses. Poor to extremely poor drainage and steep slopes are the major usage limitations.

In areas of poorly drained terrace soils and some clayey alluvial fan soils, revegetation efforts may be hindered. Major areas where these soils occur include the Laguna Seca Ranch area (milepost 99), Ortigalita Creek Valley (milepost 144 to milepost 146), and the O'Neill Forebay area from State Highway 152 to Romero Creek. In the Laguna Seca Ranch area, and in the foothill and terrace soil areas north of O'Neill Forebay, localized areas of surface and/or subsurface soils may have excessive lime content.

Stanislaus County

Soils occurring along the proposed route in Stanislaus County range from alluvial fan soils at larger intermittent stream crossings, to the terrace and foothill soils of the east side of the Diablo Range. Recent alluvial fan soils are nearly level, well-drained loams, sandy loams, clayey loams, silty clays, and clays. These soils are prime irrigated croplands with few usage limitations. Older alluvial fan soils consist of gravelly loams and clayey loams. Slopes are nearly level to moderately sloping. Irrigated crops, orchards, and pasture are the main land uses. There is a slight to moderate erosion hazard on moderately sloping and disturbed areas. The terrace soils consist of nearly level to moderately sloping deep loams, clayey loams, and clays used primarily as annual rangeland with some occasional cultivation occurring in more gently sloping areas. A slight to moderate erosion hazard in disturbed areas, as well as poor soil drainage, are the main usage limitations.

The strongly sloping to very steep calcareous loams and clayey loams on the Diablo Range foothills are used primarily for annual rangeland. Steep slopes and a moderate to high erosion hazard are the major usage limitations.

Potential impacts to soils in Stanislaus County are associated mainly with areas of steep slopes and clayey soils, and include increased runoff, erosion, and revegetation problems. The steep slopes encountered along the 4-mile section of the proposed route from Bennet Valley to Orestimba Creek, and along most of the 7-mile section from south of Little Salado Creek to north of Del Puerto Canyon, pose a moderate to severe erosion hazard.

San Joaquin County

Soils occurring along the proposed route in San Joaquin County range from gently sloping alluvial fan soils, to the terrace and upland soils of the Diablo Range foothills. These soils have generally the same characteristics described above for soils in Stanislaus County.

Sections of the proposed route in San Joaquin County intersect the most eastern footslopes and terraces of the Diablo Range. There are two major sections where steeply sloped soils present a potential high erosion hazard. Between Hospital and Lone creeks the steeply sloped terraces encountered are subject to gullying when disturbed. Generally, the erosion hazard is moderate to high, presenting some difficulty in revegetation efforts. The steep hillsides encountered in the 2-mile segment between mileposts 209 and 211 pose a high to severe erosion hazard when disturbed. In addition, these severely erosion-prone steeper slopes have shallow soils, which will make successful stabilization and revegetation in this area difficult.

Alameda County

In Alameda County, nearly all of the soils along the proposed route are typical of the Diablo Range foothills. These soils consist of strongly sloping to steep clays, clayey loams, and calcareous clayey loams. A moderate to high erosion hazard exists on disturbed slopes in most areas, and in some areas the soils are shallow. A slumping hazard exists on both undisturbed and disturbed lands, usually during winter and spring rains, where Altamont clayey soils occur on slopes greater than 15%.

The proposed route in Alameda County traverses primarily through areas of steeply sloping erosion-prone soils. Nearly all of the slopes encountered pose a significant erosion hazard, and in some local areas the steep clayey soils have the potential to slump. Side slopes associated with the larger intermittent drainages are particularly prone to erosion. As several drainages encountered by the route drain to Bethany Reservoir, erosion problems associated with construction and restoration could cause sedimentation of small impoundments above this surface water body.

A pipeline oil leak or rupture would result in short-term impacts to rangeland soils; however in the event of a spill, the potential migration of oil into tributaries leading into Bethany Reservoir or through stream culverts (accompanied by stream flow) over the California/Delta Mendota canals onto the alluvial plain croplands east of the canal(s) would be a more significant impact.

Contra Costa County

Soils encountered in Contra Costa County by the proposed project range from floodplain, coastal valley, and alluvial fan soils to steep upland foothills soils. In the southeastern part of the county, the proposed route crosses alluvial fan, valley till, and floodplain soils in the valleys of numerous creeks. These soils are very deep, are nearly level to gently sloping, and consist of clayey loams, silty clayey loams, and clays. The alluvial fan and terrace soils are used for irrigated orchards (almond and apricot) and intensive farming of row crops and alfalfa. Generally, the valley soils have no major usage limitations. Coastal valley and basin rim soils consisting of generally poorly drained clays and clayey loams occur in the Martinez area. The dominant land use in northern Contra Costa County is urban/industrial.

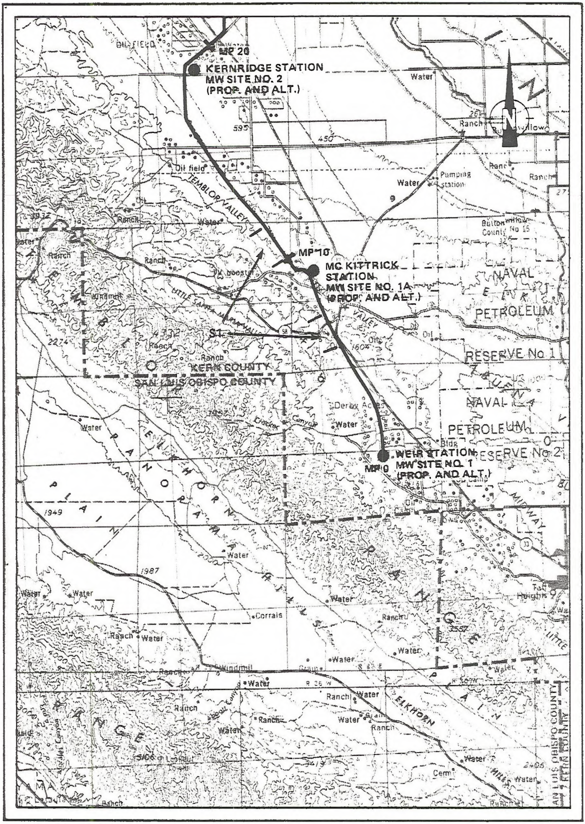
Pipeline construction in this area could result in compaction and horizon mixing which will adversely affect restoration and/or cropland productivity. Such areas include the lowland of Brushy Creek valley area and the nearly level coastal plain between Clyde and Pacheco creeks. Poorly drained clays and saline-alkali conditions in the Martinez area are major limiting factors affecting revegetation. In addition, the pipeline passes through irrigated croplands and cropland pasture in the Kellogg, Marsh, Deer, and Sand Creek valleys, where a pipeline oil leak or rupture would have a significant short-term impact on croplands.

Much of the proposed route transects steep upland soils consisting of shallow to deep clays, silty clays, and loams. Slopes are strongly sloping to very steep. The erosion hazard is moderate to high in disturbed areas. As described for Alameda County, areas of Altamont clayey soils with greater than 15% slopes may slump during wet conditions. Rangeland and some dry farming in more gently sloped areas are the primary land uses.

Areas of steep slopes presenting the highest erosion hazard include a 0.5-mile section of the proposed route adjacent to the Alameda County line; steep slopes adjacent to Dry Creek; and a 13-mile stretch of very rugged coastal hill terrain south of Antioch to the flatland areas near Clyde (milepost 249). The section of the proposed route between mileposts 240 and 245 has a particularly high potential for slumping.

MAP 1 LEGEND: MAJOR SENSITIVE SOILS AREAS

Code	Impact	Location	Description	Representative Soils Unit
S1	Moderate to high erosion potential, revegetation	McKittrick Station Area	Steep slopes	Hillbrick-Kilmer-Mendi, Elkhills

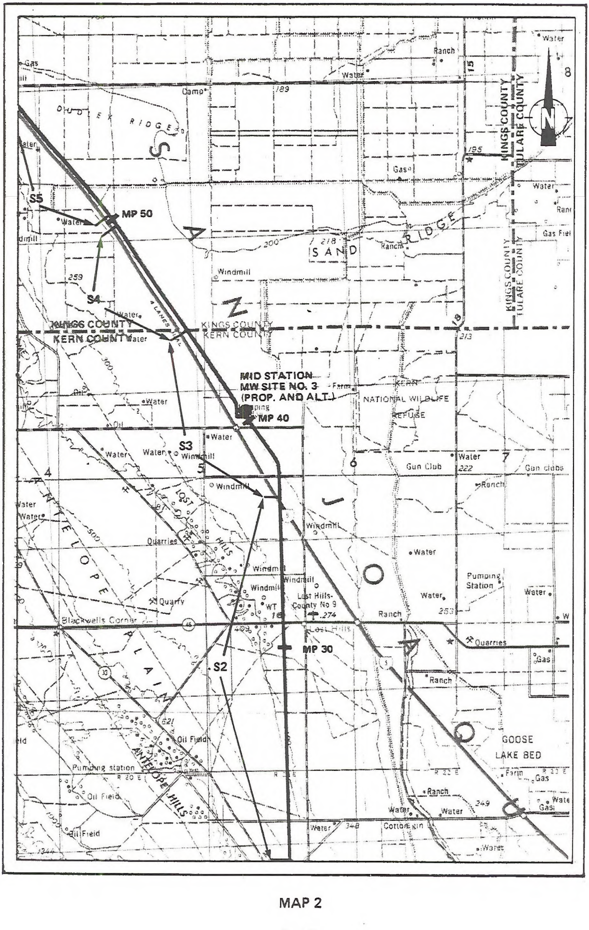

MP 20
KERNRIDGE STATION
MW SITE NO. 2
(PROP. AND ALT.)
MP 10
MC KITTRICK
STATION
MW SITE NO. 1A
(PROP. AND ALT.)
S1
WEIR STATION
MW SITE NO. 1
(PROP. AND ALT.)
MP 0
N
KERN COUNTY
SAN LUIS OBISPO COUNTY
NAVAL
PETROLEUM
RESERVE No 1
NAVAL
PETROLEUM
RESERVE No 2
TEMBLOR VALLEY
ELKHORN

SOILS

MAP 1

MAP 2 LEGEND: MAJOR SENSITIVE SOILS AREAS

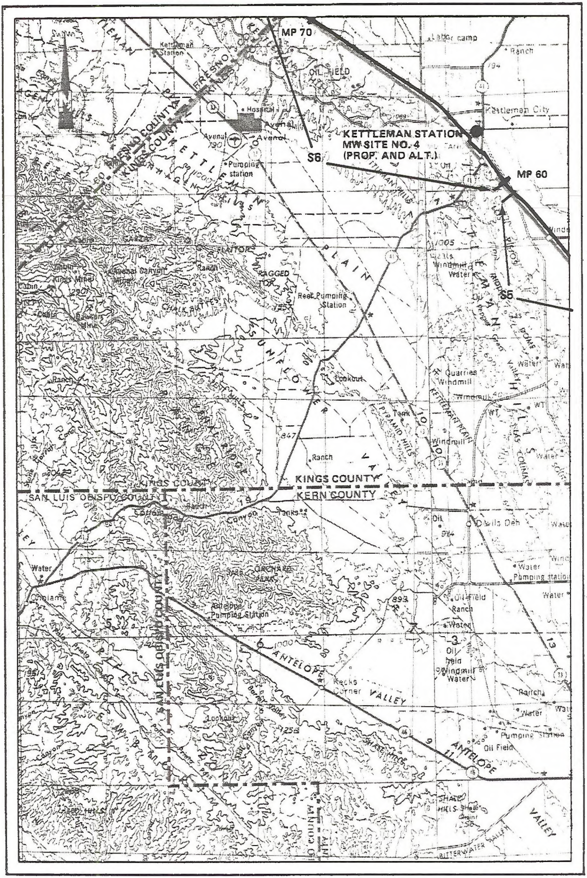
Code	Impact	Location	Description	Representative Soils Unit
S2	Horizon mixing and compaction	San Joaquin Valley east of the Lost Hills	Irrigated cropland	Panoche-Milham-Kimberlina, Kimberlina
S3	Horizon mixing and revegetation	Milepost 36 to Kings County line	Moderate to strong saline-alkalinity, slow permeabilities	Nahrub-Lethant-Twisselman, Garces-Panoche
S4	Revegetation	Kern County line to milepost 49	Saline-alkalinity, possibly slow permeabilities	Lethent-Garces-Panoche


S5
MP 50
S4
KINGS COUNTY
KERN COUNTY
MID STATION
MW SITE NO. 3
(PROP. AND ALT.)
MP 40
S3
MP 30
S2
NATIONAL WILDLIFE REFUGE
GOOSE LAKE BED
ANTELOPE PLAIN
ANTELOPE HILLS
LOST HILLS
SAND RIDGE
DUDLEY RIDGE
Blackwells Corner
KINGS COUNTY
TULARE COUNTY
N

MAP 2

MAP 3 LEGEND: MAJOR SENSITIVE SOILS AREAS

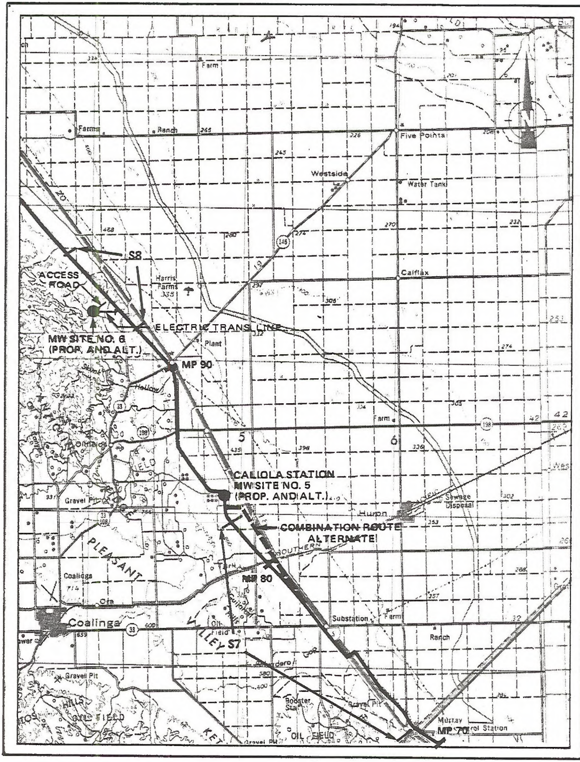
Code	Impact	Location	Description	Representative Soils Unit
S5	Horizon mixing	Milepost 49 to milepost 59	Irrigated cropland	Wasco-Panoche-Westhaven
S6	Moderate water hazard, sedimentation to adjacent irrigated pastures and croplands on alluvial fans	Kettleman Hills	Steep slopes	Kettleman-Cantua-Mercey


MP 70
KETTLEMAN STATION
MW SITE NO. 4
(PROP. AND ALT.)
S6
MP 60
S5
Kettleman City
Avenal
KINGS COUNTY
KERN COUNTY
SAN LUIS OBISPO COUNTY
FRESNO COUNTY
ANTELOPE VALLEY
Devils Den

MAP 3

MAP 4 LEGEND: MAJOR SENSITIVE SOILS AREAS

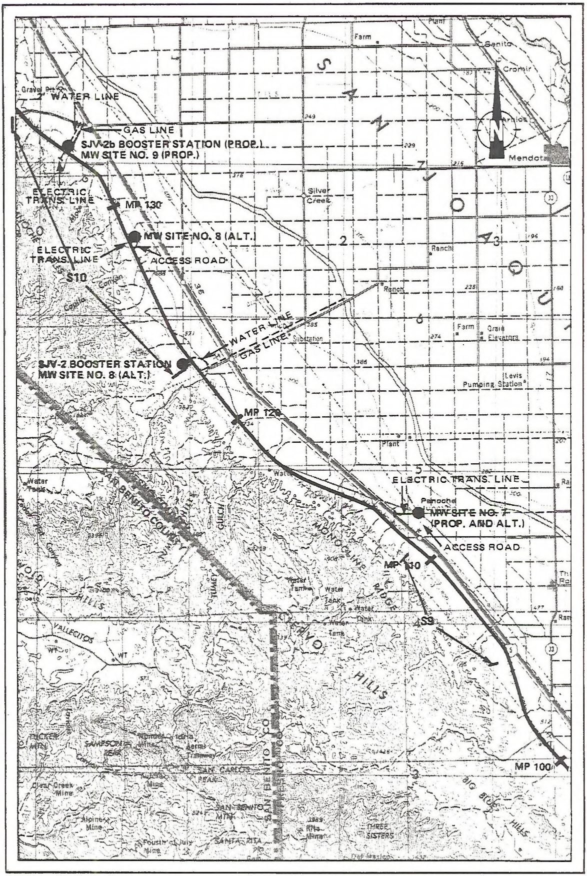
Code	Impact	Location	Description	Representstive Soils Unit
S7	Horizon mixing	Kings County line to proposed micro-wave station No. 5	Irrigated cropland	Unnamed
S8	Water erosion	Big Blue Hills	Steep slopes, possible shallow soils	Unnamed


S8
ACCESS ROAD
MW SITE NO. 6 (PROP. AND ALT.)
ELECTRIC TRANS LINE
MP 90
CALIOLA STATION MW SITE NO. 5 (PROP. AND ALT.)
COMBINATION ROUTE ALTERNATE
MP 80
S7
MP 70
Five Points
Westside
Water Tank
Calflax
Harris Farms
Plant
Farm
Huron
Sewage Disposal
Coalinga
Gravel Pit
Substation
Ranch
Booster Sta
OIL FIELD
PLEASANT
VALLEY

MAP 4

MAP 5 LEGEND: MAJOR SENSITIVE SOILS AREAS

Code	Impact	Location	Description	Representative Soils Unit
S9	Water erosion	Ciervo Range	Steep slopes, possible shallow soils	Unnamed
S10	Horizon mixing	Panoche to Little Panoche Creek	Irrigated cropland	Unnamed

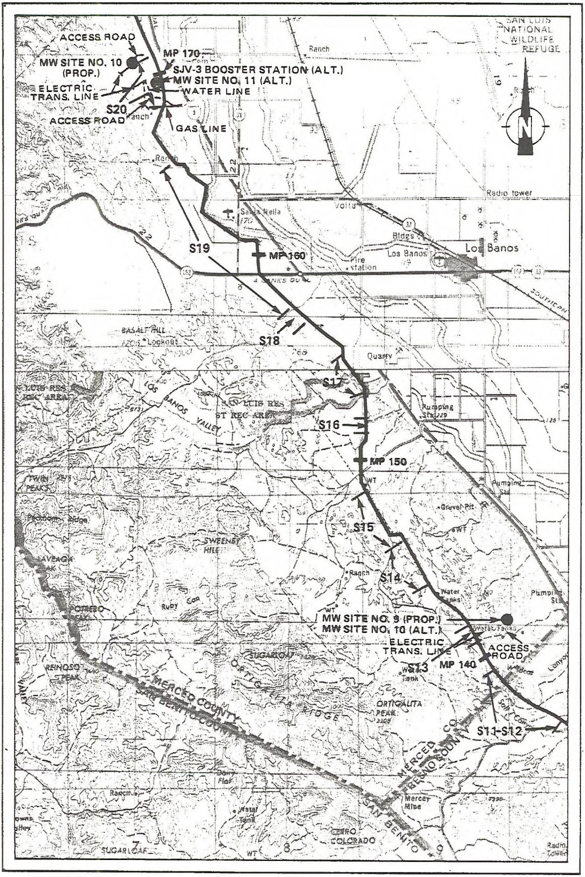


WATER LINE
GAS LINE
SJV-2b BOOSTER STATION (PROP.)
MW SITE NO. 9 (PROP.)
ELECTRIC TRANS. LINE
MP 130
MW SITE NO. 8 (ALT.)
ELECTRIC TRANS. LINE
ACCESS ROAD
S10
WATER LINE
GAS LINE
SJV-2 BOOSTER STATION
MW SITE NO. 8 (ALT.)
MP 120
ELECTRIC TRANS. LINE
MW SITE NO. 7
(PROP. AND ALT.)
ACCESS ROAD
MP 110
S9
MP 100
Mendota
Silver Creek
Levis Pumping Station
Panoche
SAN BENITO CO

MAP 5

MAP 6 LEGEND: MAJOR SENSITIVE SOILS AREAS

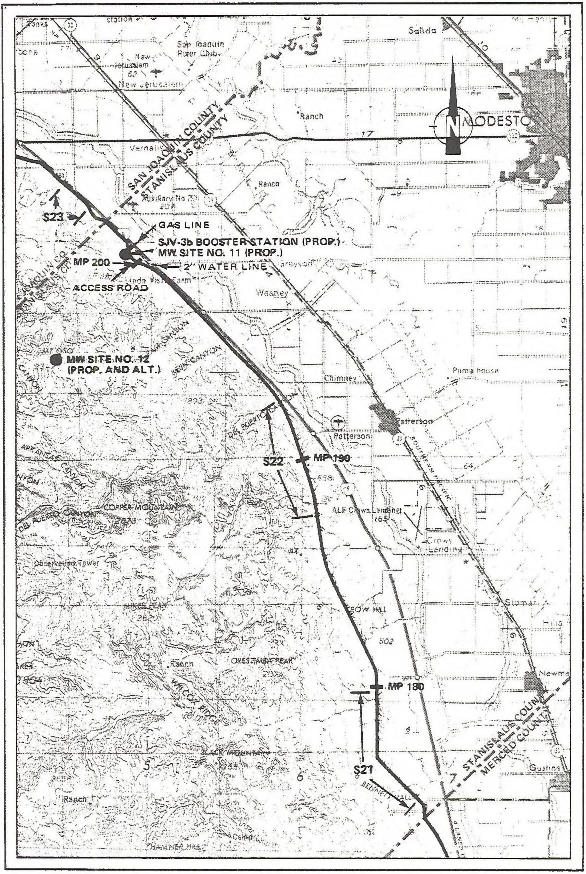
Code	Impact	Location	Description	Representative Soils Unit
S11	Water erosion	Between Salt and Wildcat canyons	Steep slopee	Unnamed
S12	Water erosion and revegetation on steeper grades	On terrace and alluvial fan eoils that are clayey	Slow permeability	Unnamed
S13	Horizon mixing, revegetation	Laguna Seca Ranch	Poesible excess lime content in some areas, in-creasing with depth	Damlius-Bapoe-Los Banos
S14	Water erosion, revegetation	Southeast of Ortigalita Creek Crossing	Steep slopes	Arburua-Wisflat
S15	Horizon mixing, revegetation	Ortigalita Creek Valley	Poesible exceas lime content in eome areae, in-creasing with depth	Damlius-Bapoe-Los Banos
S16	Water erosion, revegetation	Salt Creek Valley side slopes	Steep slopes	Arburua-Wisflat
S17	Water erosion, revegetation	North of Los Banoe Reeervoir	Steep slopes	O'Neill-Apollo
S18	Water erosion, revegetation	Slopee to tributary near milepost 153	Steep slopes	O'Neill-Apollo
S19	Horizon mixing, revegetation	O'Neill Forebay Area	Possible excess lime content in some areas, in-creasing with depth	O'Neill-Apollo
S20	Water erosion, revegetation	Proposed microwave site No. 10 area	Steep slopes	O'Neill-Apollo


ACCESS ROAD
MW SITE NO. 10
(PROP.)
MP 170
SJV-3 BOOSTER STATION (ALT.)
MW SITE NO. 11 (ALT.)
ELECTRIC
TRANS. LINE
WATER LINE
S20
ACCESS ROAD
GAS LINE
SAN LUIS
NATIONAL
WILDLIFE
REFUGE
N
Radio tower
Santa Nella
Volta
S19
MP 160
Los Banos
S18
BASALT HILL
Quarry
S17
SAN LUIS RES
ST REC AREA
S16
MP 150
S15
SWEENEY HILL
S14
MW SITE NO. 9 (PROP.)
MW SITE NO. 10 (ALT.)
ELECTRIC
TRANS. LINE
ACCESS
ROAD
S13
MP 140
ORTIGALITA PEAK
S11-S12
MERCED COUNTY
SAN BENITO COUNTY
MERCED CO.
FRESNO COUNTY
CERRO COLORADO
SUGARLOAF

MAP 6

MAP 7 LEGEND: MAJOR SENSITIVE SOILS AREAS

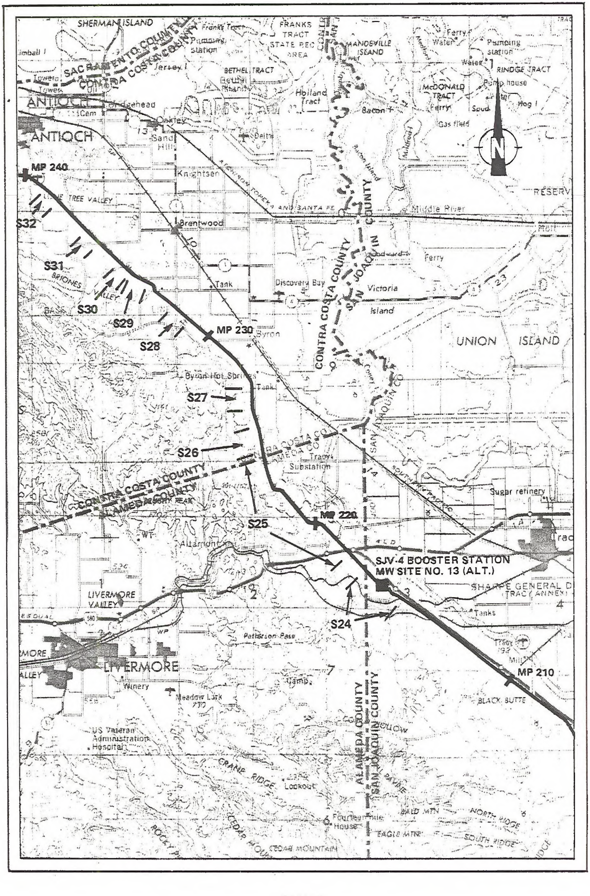
Code	Impact	Location	Description	Representative Soils Unit
S21	Water erosion, revegetation	Bennet Valley to Orestimba Creek	Steep slopes	Unnamed
S22	Water erosion, revegetation	Little Salado Creek to Del Puerto Canyon	Steep slopes	Unnamed
S23	Moderate to high water erosion hazard, revegetation	Hospital Creek to Lone Creek	Steep slopes	Denverton


Salida
San Joaquin River Club
New Jerusalem
MODESTO
SAN JOAQUIN COUNTY
STANISLAUS COUNTY
Vernalis
Ranch
S23
GAS LINE
SJV-3b BOOSTER STATION (PROP.)
MW SITE NO. 11 (PROP.)
MP 200
2" WATER LINE
Linda Vista Farm
ACCESS ROAD
Westley
MW SITE NO. 12
(PROP. AND ALT.)
Chimney
Pump house
Patterson
S22
MP 190
ARKANSAS CANYON
COPPER MOUNTAIN
DEL PUERTO CANYON
ALF Crows Landing
Crows Landing
Observation Tower
MIKES PEAK
ORESTIMBA PEAK
WILCOX RIDGE
Ranch
Newman
MP 180
STANISLAUS COUNTY
MERCED COUNTY
BLACK MOUNTAIN
S21
Gustine
Ranch

MAP 7

MAP 8 LEGEND: MAJOR SENSITIVE SOILS AREAS

Code	Impact	Location	Description	Representative Soils Unit
S24	High to extremely high erosion hazard, revegetation	SJV-4 booster station vicinity (milepost 169 to milepost 171)	Steep slopes	Lynne-Kettleman
S25	Water erosion, slumping of clayey soils, revegetation, sedimentation to Bethany Reservoir	Moderately steep hillsides in Alameda County	Slope, clayey soila in some areas	Lynne, Altamont
S26	Water erosion, revegetation	Near Alameda County line	Steep slopes	Altamont-Diablo-Fontana
S27	Horizon mixing, revegetation	Brushy Creek Valley	Saline-alkalinity, poor drainage, clayey	Marcuse-Solano-Pescadero
S28	Horizon mixing, compaction	Kellogg Creek Valley	Cropland, pasture	Brentwood-Rincon-Zamora
S29	Horizon mixing, compaction	Marsh Creek Valley	Irrigated cropland	Brentwood-Rincon-Zamora
S30	Water erosion, revegetation	Dry Creek Valley side slopes	Steep slopes	Altamont-Diablo-Fontana
S31	Horizon mixing, compaction	Deer Creek Valley	Cropland, pasture	Capay-Rincon
S32	Horizon mixing, compaction	Sand Creek Valley	Cropland, pasture	Capay-Rincon

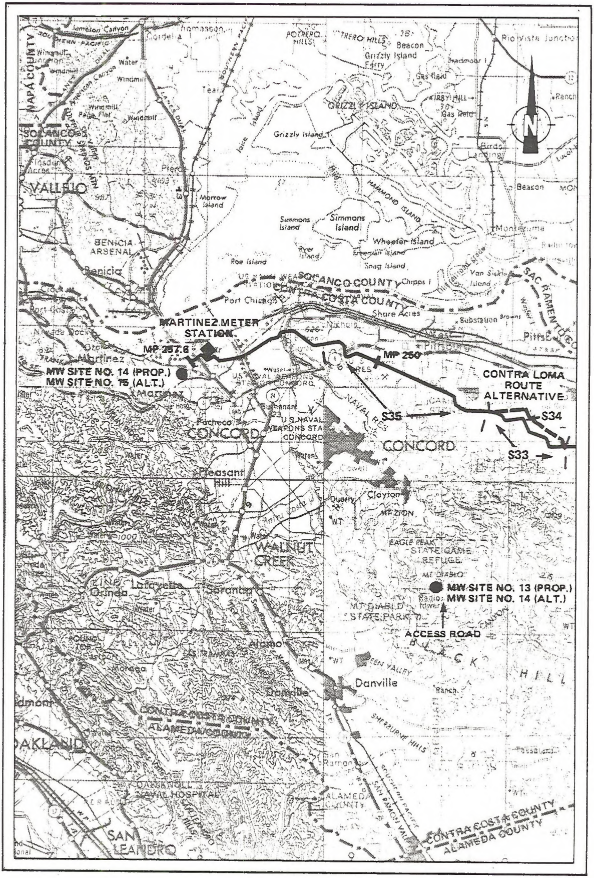


MP 240
MP 230
MP 220
MP 210
S24
S25
S26
S27
S28
S29
S30
S31
S32
SJV-4 BOOSTER STATION
MW SITE NO. 13 (ALT.)
ANTIOCH
LIVERMORE
CONTRA COSTA COUNTY
ALAMEDA COUNTY
SAN JOAQUIN COUNTY
SACRAMENTO COUNTY
UNION ISLAND
Brentwood
Knightsen
Oakley
Byron
Discovery Bay
Byron Hot Springs
Altamont
LIVERMORE VALLEY
Patterson Pass
US Veteran Administration Hospital
Sugar refinery
Tracy Substation
Victoria Island
Middle River
BLACK BUTTE
CEDAR MOUNTAIN

MAP 8

MAP 9 LEGEND: MAJOR SENSITIVE SOILS AREAS

Code	Impact	Location	Description	Representative Soils Unit
S33	Slumping, water erosion, revegetation	Southwest of Antioch	Very steep slopes clayey soils	Altamont-Diablo-Fontana
S34	Water erosion, revegetation	Contra Loma Alternative Route	Steep slopes	Altamont-Diablo-Fontana
S35	Horizon mixing, revegetation	Coastal Valley	Saline-alkalinity, poor drainage, clayey	Clear Lake-Cropley


MARTINEZ METER STATION
MP 257.6
MP 250
MW SITE NO. 14 (PROP.)
MW SITE NO. 15 (ALT.)
CONTRA LOMA ROUTE ALTERNATIVE
S35
S34
S33
MW SITE NO. 13 (PROP.)
MW SITE NO. 14 (ALT.)
ACCESS ROAD
CONCORD
WALNUT CREEK
Danville
Clayton
SOLANO COUNTY
CONTRA COSTA COUNTY
ALAMEDA COUNTY
NAPA COUNTY
SAN LEANDRO
OAKLAND
Benicia
Martinez
Pleasant Hill
Lafayette
Orinda
Moraga
Alamo
Pittsburg
Grizzly Island
Simmons Island
Roe Island
Ryer Island
Wheeler Island
Port Chicago
MT DIABLO STATE PARK
EAGLE PEAK STATE GAME REFUGE
N

MAP 9

THIS PAGE INTENTIONALLY LEFT BLANK

C.3 SURFACE WATER

Kern County

The proposed pipeline begins near Taft, Kern County, on the eastern side of the Temblor Range. The route follows the McKittrick and Temblor valleys, and then heads north into the San Joaquin Valley. The surface water drainages in Kern County are part of the Tulare Lake Basin. The drainages intersected by the proposed route feed into irrigation canals, but generally flow only during the rainy season. All of the creeks crossed by the proposed project in Kern County are intermittent creeks and include Buena Vista Creek, Salt Creek, Temblor Creek, Chico Martinez Creek, and a number of unnamed tributaries. In addition, the proposed pipeline crosses the California Aqueduct at milepost 32.3.

Due to the intermittent nature of these creeks, the water quality during periods of flow reflects the adjacent and upstream land use characteristics; i.e., high dissolved solids concentrations, salinity, and agricultural chemical content. In addition, streams in this part of the San Joaquin Valley receive high discharges of oil field wastewater containing unacceptable levels of salinity and boron (USGS 1984). Water quality in the California Aqueduct reflects the Sacramento River drainage. Streambeds also reflect the runoff characteristics of the drainage system, and are expected to consist of alluvial fan deposits and possibly caliche layers.

A large section of the proposed route in Kern County, from mileposts 21.5 to 36, crosses irrigated croplands east of the Lost Hills area. High natural silt loads as well as construction-generated sediments transported by storm water surface runoff via intermittent drainages to the croplands have the potential to impair or restrict irrigation, and subsequent deposition of the sediments over the soils could reduce crop productivity. During operation, a pipeline oil leak or rupture could cause oil to flow along these drainages, resulting in a significant short-term impact to the irrigated croplands east of the Lost Hills.

Based on the Draft Flood Insurance Study prepared for the Federal Emergency Management Agency (FEMA), there are three Zone A flood areas (areas affected by a 100-year flood event) along the route in Kern County. These include the region south of the Salt Creek crossing (milepost 13.3); Chico Martinez Creek, south of Kernridge station (mileposts 18.2, 18.6); and Santos Creek (mileposts 21.5, 22.2). (Note: Although the pipeline does not cross Santos Creek, it is within the 100-year flood zone of the drainage.) Failure to weight or stabilize the pipeline in these areas could result in flotation and possible rupturing of the pipe.

Kings County

In Kings County, the proposed route follows Interstate 5 (I-5) at the base of the Kettleman Hills. Due to the steep topography of the hills, many intermittent surface water channels are crossed by the proposed route. Table 3-13 in Section 3.2.4 lists the eight arroyos crossed by the pipeline. In addition, the pipeline crosses the California Aqueduct at milepost 61.3.

Flow characteristics and water quality of these surface waters are similar to those described above for Kern County. The streambed characteristics vary from clayey basin deposits in the Dundley Ridge area to semi-consolidated alluvium, sometimes overlain by older alluvium and possibly caliche layers, in the Kettleman City and Los Viejos area.

Similar potential impacts as described above for Kern County exist along the proposed route in Kings County. Due to the steeper slopes, the potential for soil erosion and subsequent sedimentation is greater than in Kern County.

According to FEMA, no Zone A (100-year) flood areas are located along the proposed route in this portion of Kings County.

Fresno County

In Fresno County, the proposed route runs west of I-5 along the edge of the foothills. The surface water drainages in the county are part of the Tulare Lake Basin. The proposed route crosses the Coalinga Canal (milepost 84.6), two perennial streams--Los Gatos Creek (milepost 79.6) and an unnamed creek (milepost 89.3)--and 82 crossings of intermittent creeks (see Table 3-13 in Section 3.2.4). The route also passes near two reservoirs in Fresno County, both of which will not be affected because of their location at elevations above the proposed route. The two reservoirs--a small unnamed reservoir northwest of Caliola station and the Little Panoche reservoir near milepost 131.0--are located within 2 miles of the pipeline.

In the lower elevations of the proposed route, stream flows, water quality, and streambed characteristics will be similar to those encountered in Kings and Kern counties. However, at the higher elevations, the streams flow at higher velocities and are more erosion-prone than depositional in character. Scour potential may be a critical factor for some of these streams.

As described above for Kern and Kings counties, irrigated cropland areas between Panoche Creek (milepost 122.9) and Little Panoche Creek (milepost 136.0) and from the Kings County line are sensitive to sedimentation. These croplands are prime agricultural lands. In addition, Los Gatos Creek is a perennial watercourse at the proposed point of crossing; instream disturbance during construction will generate a downstream sedimentation potential.

Flooding in the area of the proposed route in Fresno County occurs primarily from prolonged heavy rainfall over the foothills or from short cloudbursts. In the area of I-5, flood waters could back up behind the highway's embankment. Zone A flood areas occur along the proposed route at mileposts 78.4-79.8, 118.2, 119.5, 119.8, 120.8, 121.6, 122.4-123.1, and 123.5 (FEMA 1982). These flood areas are associated with Los Gatos and Panoche creeks, as well as with some of the drainages north of Panoche Creek.

Merced County

In Merced County, the proposed route traverses northwest through the foothills, then back into the valley toward the Stanislaus County line. The surface water drainages in Merced County are part of the San Joaquin River Basin. The pipeline crosses four named intermittent creeks, including Ortigalita Creek, which is crossed four times; 22 crossings of unnamed intermittent creeks; and the California Aqueduct, which is crossed at two locations (mileposts 160.7 and 165.9). At milepost 164.1, the proposed route crosses a portion of the Delta Mendota Canal, which links O'Neill Forebay and the main segment of the Delta Mendota Canal.

Stream flow and chemical features in Merced County will generally be similar to those already described for other counties; i.e., characteristic for the region, although streambeds will include more silt, sand, and gravel, with a veneer of alluvium, and probably will consist of shale and possibly hard sandstones or conglomerate beds.

Similar to Fresno County, the greatest potential for erosion and scour in Merced County occurs in the foothills, particularly on steep slopes southeast of the proposed Ortigalita Creek crossing; the steep slopes leading in and out of the Salt Creek Valley; the slopes north of the Los Banos Reservoir; the steep slopes near milepost 153; and the extremely steep slopes in the vicinity of Cottonwood Hill and Quinto Creek (milepost 170).

The proposed route passes within 0.1 mile of the Los Banos Reservoir, but will not affect the reservoir since the pipeline is aligned downstream of the dam's spillway. The reservoir is part of the Los Banos Creek State Recreation Area. The proposed route also crosses downstream within 0.1 mile of the O'Neill Forebay and within 2.5 miles of the San Luis Reservoir. These systems will not be impacted by the proposed project; however, these large retention systems could wash out and damage the pipeline in the unlikely event of a sudden catastrophic release of water.

The proposed route will cross the California Aqueduct (milepost 160.7) and the Delta Mendota Canal (milepost 164.1) via aerial suspension bridges. While the use of aerial suspension bridges avoids potential construction impacts from below-channel directional drilling, rupture of the pipeline and a spill in these watercourses would result in a significant impact to water quality and use.

Based on FEMA maps, no Zone A flood areas are indicated along the proposed route in Merced County.

Stanislaus County

In Stanislaus County, there is a distinct transition from the irregular terrain of the foothills, to the relatively flat valley floor in the county. For the most part, the pipeline is situated in the foothills region. The proposed route crosses eight named and 12 unnamed intermittent creeks (see Table 3-13 in Section 3.2.4). No reservoirs are located near the proposed route in Stanislaus County.

The flow, quality, and streambed conditions of the streams crossed in Stanislaus County are similar to those encountered in Merced and Fresno counties.

Similar potential impacts as described for Merced and Fresno counties above apply to Stanislaus County, particularly between Hospital and Lone creeks and the steep hillsides encountered along a 2-mile segment between mileposts 209 and 211.

Flooding in the foothills region is usually the result of rainstorms that occur between the months of November and April. Orestimba, Salado, and Del Puerto creeks have small channel capacities and very wide, undefined overflow areas typical of alluvial fans. Generally, shallow flooding can be expected to occur in these areas, and flooding in the lowland areas is controlled by road, railroad, and canal embankments (FEMA 1980). No Zone A flood areas occur along the pipeline route in Stanislaus County.

San Joaquin County

In San Joaquin County, the pipeline route follows Interstate 580 along the base of the foothills of the Diablo Range. The pipeline crosses one perennial creek, Lone Tree Creek, at milepost 205.3. Three named intermittent tributaries are crossed--Hospital Creek, Corral Hollow, and Peterson Run--along with 10 unnamed tributaries. The proposed route also crosses the underground Hetch-Hetchy Aqueduct. The physical and chemical characteristics of these watercourses will be similar to those described above for the other counties.

Similar potential impacts as described for Kern and Kings counties apply to San Joaquin County, particularly at Lone Tree Creek, which is perennial at the proposed point of crossing. In addition, potential impacts from pipe flotation may occur at Corral Hollow Creek, a designated Zone A flood area.

Alameda County

The proposed route crosses the northeast corner of Alameda County in the foothills region. The pipeline crosses the intermittent Mountain House Creek, along with 11 unnamed intermittent drainages. Physical and chemical stream features of these water bodies will be similar to those encountered in San Joaquin County.

Similar potential impacts as described above for San Joaquin County apply to the proposed route in Alameda County, particularly at the side slopes associated with the larger intermittent drainages, which are especially erosion-prone. The route is aligned 0.9 miles upgradient of Bethany Reservoir, which is part of the California Aqueduct system. A large rupture of the pipeline and a major oil spill could significantly impact this retention system and, if not contained, the oil would migrate into stream syphons over the California/Delta Mendota canals into alluvial plain cropland areas east of the canal(s).

FEMA has not identified any flood-prone areas along the proposed route in this portion of Alameda County.

Contra Costa County

The proposed route in Contra Costa County generally crosses through the foothills region to Pittsburg, before turning west towards its terminus in Martinez. Contra Costa County includes parts of both the San Joaquin Basin and the San Francisco Bay Basin. The proposed route crosses four unnamed perennial creeks: Seal and Walnut creeks; Pacheco Creek at two points; and a number of intermittent drainages (see Table 3-13 in Section 3.2.4). In addition, the proposed route crosses several canals and aqueducts, including the Contra Costa Canal and the Mokelumne Aqueduct.

Water quality in Contra Costa County generally reflects the more urban nature of the area as a whole. As a result, non-point source pollution from agricultural runoff is less important. Due to topography, stream flow velocities will be high, with streambeds of clay and silt in addition to bedrock and possibly hard sandstone. At the proposed terminus in Martinez, the pipeline traverses a brackish marsh area. This area, while not critical as a recreational or water supply resource, is biologically important (see Section 3.2.13).

The pipeline passes through irrigated croplands and pastures in Kellogg, Marsh, Deer, and Sand Creek valleys across three perennial creeks: Seal, Walnut, and Pacheco. These lands are sensitive to sedimentation and oil spill impacts.

The pipeline route is located within 1 mile downgradient of the Marsh Creek Reservoir. The route is located 0.5 miles upgradient of the southern embankments of the Contra Loma Reservoir and the Antioch Municipal Reservoir. The presence of vernal pools (seasonal water bodies which form during spring runoff) in the county is discussed in Section 3.2.13. All of these systems could be significantly impacted if oil- or sediment-laden waters were to breach the associated embankments and enter the systems.

Zone A flood areas, as mapped by USGS (1974) and the Department of Housing and Urban Development (1984), include portions of Brushy Creek (milepost 227.3), Kellogg Creek (milepost 231.9), and Pacheco Creek (milepost 256.7).

C.4 SOCIOECONOMICS AND TRANSPORTATION

Kern County

Kern County is the nation's third most productive agricultural county, and is the leading oil and mineral producing county in both California and the United States as a whole. Since 1980, the county's population has increased by approximately 21%, with a level of 486,800 reported in January 1986. The county is expected to continue to grow, with a population of about 620,000 expected by the year 2000 (California Department of Finance, Population Research Unit 1986).

The proposed route traverses through the sparsely-populated western portion of the county. Taft, the largest incorporated community near the route, reported a 1986 population of about 6,100. The principal community within 50 miles of the route is Bakersfield.

In addition to agriculture and mineral production, economic activities in Kern County center around related manufacturing, as well as the aerospace industry and military installations, especially Edwards Air Force Base. Tourism is also important, accounting for approximately $200 million in business in the county in 1986 (Kern County Board of Trade 1986). The peak tourist season is June through August. Overall, agriculture, government, retail trade, services, and mineral extraction account for about 78% of wage and salary employment in the county.

Both the civilian labor force and employment in Kern County have increased steadily since 1980. However, unemployment also has increased from 7.7% in 1980 to approximately 14.1% in March 1986. This is a result of both immigration and the recent worldwide drop in energy prices; unemployment also fluctuates seasonally as a result of seasonal hiring on farms. Per capita personal income in Kern County was $10,848 in 1983 (U.S. Department of Commerce, Bureau of Economic Analysis).

The 1983 county housing stock was estimated at 165,959 units. The vacancy rate is approximately 9%.

Over 2,200 hotel/motel rooms are available within 50 miles commuting distance of the proposed pipeline route; these are principally located in Bakersfield. The county also includes various state and private campgrounds.

The county has adequate infrastructure facilities to serve its population, including a well-developed transportation system. The major highways that are crossed by the proposed pipeline route include State Highways 58, 33 and 46 and Interstate 5. The latter serves as a major north-to-south route through the Central Valley. State Highway 33 also traverses north-to-south, while State Highways 58 and 46 provide east-to-west access.

Kings County

Kings County, the least populated of the counties along the proposed route, has an estimated 1986 population of 85,300. This represents an increase of 16% since 1980. Avenal, the closest community to the proposed route, reported an estimated 1986 population of 4,540. Other larger communities within 50 miles of the route include Kettleman City and Hanford.

The county economy centers primarily around agriculture, government, and wholesale/retail trade. Tourism accounts for only approximately $9 million in annual business revenue, wages, and salaries.

The civilian labor force consists of approximately 31,000 potential wage earners. The March 1986 unemployment rate was 14.9%. Per capita personal income averages $9,285.

The county housing stock consists of approximately 29,000 units, of which 7% are vacant. Transient lodging within 50 miles of the route consists of about 500 rooms (this includes rooms in Visalia, which is located about 45 miles east of the proposed route in Tulare County).

The county as a whole is served by various roads and railroads including Interstate 5 and 99; State Highways 33, 43, and 41; and the Southern Pacific railroad. The proposed route crosses only State Highway 41.

Fresno County

The 1986 population in Fresno County is estimated at 580,200, an increase of 13% since 1980. Over half of this population is centered in the City of Fresno, which is located about 40 miles east of the proposed pipeline. Communities near the proposed route, which traverses sparsely populated areas, include Coalinga (population 7,671) and Mendota (population 6,062).

Agriculture is the dominant industry in the county, and Fresno County has more acres under irrigation than any other county in the United States. Other primary economic sectors include government, manufacturing, and services. Tourism is also important, accounting for total travel expenditures of almost $225 million annually.

Both the county labor force and employment have grown steadily in recent years, and resulted in an average annual employment increase of about 3.5% since the mid-1970s. However, unemployment has also increased; the March 1986 unemployment rate was 16.8%. Per capita personal income in the county is $10,922.

The county as a whole has a housing stock of approximately 60,000 units, with a vacancy rate of 5.9%. The vacancy rates in Coalinga and Mendota, the communities nearest the proposed route, are 5.4% and 2.9%, respectively. In addition, the county has an estimated 6,400 transient rooms available, of which about 3,300 are within 50 miles of the proposed route.

Through Fresno County, the proposed route crosses and then generally parallels Interstate 5. Other highways traversed include State Highways 198, 145, and 33. The proposed route also crosses a Southern Pacific railroad right-of-way.

Merced County

Merced County, located in the center of the San Joaquin Valley, has a 1986 population of 162,100 representing an increase of 20% since 1980. Communities near the proposed route, however, are small; they include Los Banos (population 12,100), Gustine (population 3,503), and Dos Palos (population 3,782). Merced (population 36,500) is the largest community within 50 miles of the route.

Agriculture is the county's largest economic sector, with 92 crops grown in commercial quantities. Other important economic sectors include government, retail/wholesale trade, and services.

The 1986 civilian labor force is approximately 73,000 includes an increase of about 4,000 since 1983. Employment in the county is expected to continue to grow. The projected annual 1986 unemployment rate for the county is estimated at about 12.8% (Merced County Office of Economic and Strategic Development 1986). However, the March 1986 unemployment rate was estimated as 16.8% (California Employment Development Department 1986). Per capita income is $9,730.

The county's housing stock consists of approximately 55,091 units. Of these, 9.3% are vacant. There are approximately 1,500 hotel rooms in Merced County, as well as numerous mobile home parks. Over 300 rooms are available within 50 miles of the proposed pipeline route.

Through Merced County, the proposed route traverses west of and parallel to Interstate 5. The proposed route crosses State Highway 152.

Stanislaus County

Stanislaus County has a 1986 population of 309,400. This represents a population increase of over 16% since 1980. Most of this population, and the recent population growth, is concentrated east of the proposed route. in and near the larger cities. The areas near the route are sparsely populated, and include small incorporated communities such as Patterson (population 4,000), Newman (population 2,600), Crows Landing (population 260), and Westley (population 1,100). Modesto (population 106,100) is the largest community within 50 miles of the proposed route.

The county economy is oriented around agriculture, services, manufacturing and wholesale/retail trade. The county's civilian labor force includes approximately 136,000 persons; the unemployment rate in March 1986 was 17%. Per capita income was $10,687 in 1983.

Stanislaus County includes 116,049 housing units and reported a vacancy rate of 7% in 1986. Public services and facilities are generally adequate for the existing population but in some areas may require expansion in order to accommodate further growth (Stanislaus County Housing Element 1982).

The proposed route through Stanislaus County is aligned parallel and to the west of Interstate 5. No major state or federal highways or other rights-of-way are traversed.

San Joaquin County

The population of San Joaquin County has grown by 22% since 1980. The 1986 population level is 423,200. Tracy, the closest community to the proposed route, reported an estimated 1986 population of 18,428. Stockton (population 149,800) is the largest community within 50 miles of the proposed route.

San Joaquin has a relatively diverse economic base. Major economic sectors include government, manufacturing (including food processing), agriculture, and retail/wholesale trade. Of these, agriculture and related activities are of prime importance. The March 1986 unemployment rate for the county was 13.9%. Per capita income for the county averaged $10,906.

The county includes 156,053 housing units, and had a countywide vacancy rate of 7% in 1986. Over 780 transient rooms are available within 50 miles of the proposed route.

In San Joaquin County, the proposed route does not traverse any major highway or other rights-of-way. Through the entire county, the route is aligned west of and parallel to Interstate 580.

Alameda County

Alameda County, which has a 1986 population of 1.2 million, is the most populated of the eight counties. However, the proposed route traverses only a small portion of the northeasternmost part of the county (i.e., the Livermore-Amador Valley Planning Unit). The population of this area is approximately 188,000, most of which is concentrated in the cities of Dublin and Livermore, and in the San Ramon Valley. These areas are west of the proposed route.

The primary economic sectors in the county are retail trade, government services, and wholesale trade/manufacturing. Agriculture is less important than in the southern counties along the proposed route, while tourism accounts for $857 million in expenditures annually. The unemployment rate for Alameda County was 6.5% in March 1986. Per capita income averaged $13,971, the eighth highest in the state.

The county housing stock included 475,252 units in 1986. The vacancy rate is about 3%. Over 1,300 hotel/motel rooms are located within 50 miles of the proposed route. However, over 10,000 rooms are located in the east San Francisco Bay Area as a whole, which includes Alameda and Contra Costa counties; this accounts for about 3.7 million rooms available on an annual basis. The occupancy rate in this area is 65.7% (Pannell Kerr Forster 1985).

Alameda County is fully serviced by a well-developed transportation system which includes Interstates 580 and 680, U.S. Route 50, and State Highways 84, 21, 9, and 17. The proposed pipeline route traverses only U.S. Route 50/Interstate 580 as it diverges from Interstate 580 to track north into Contra Costa County.

Contra Costa County

Since 1980, Contra Costa County's population has increased from 656,380 to 724,000, an increase of about 10%. Most of this growth has been centered in or near the cities of Concord, Antioch, Martinez, Pittsburg, and Oakley.

The county's economy has been gradually changing from rural to suburban and is now based on industrial and agricultural activities, as well as on suburban support services for the Oakland-San Francisco areas. Primary employment sectors include retail/wholesale trade, services, government, and manufacturing. Since 1980, employment in the county has increased by over 30,000 jobs, bringing total employment to approximately 233,000. The county's March 1986 unemployment rate was 5.9%, while per capita income averaged $15,785, the fifth highest in the state.

The county's housing stock has increased by approximately 26,500 units since 1980, bringing the total number of units to 278,900. The vacancy rate is 3%. The area within 50 miles of the proposed route has a hotel/motel stock of more than 1,200 rooms.

Major highways in Contra Costa County include Interstates 680 and S80 (north-to-south) and State Highway 4 (east-to-west). The proposed route crosses State Highway 4, but does not traverse any other major rights-of-way.

C.5 LAND USE AND RECREATION AND LAND USE FEATURE MAPS

Kern County

Land Uses Along the Right-of-Way. The proposed pipeline originates in Kern County near Fellows. It traverses in a northwesterly direction to the existing Kernridge station, where it turns northeast and crosses Highway 33. The pipeline proceeds north, crossing Highway 46 and Interstate 5 (I-5). It then follows I-5 on the east side of the interstate to the Kern-Kings County boundary.

In Kern County, the proposed route passes through 9 miles of oil fields until it crosses Highway 33; the pipeline then passes through 19 miles of cultivated farmland and, in the northernmost portion of the county, passes through about 16 miles of uncultivated rangeland to the county border (see Table 3-24 in Section 3.2.9). Short-term impacts on these land uses, including noise, dust, and traffic congestion, will occur during project construction.

BLM has significant holdings for surface mineral rights in Kern County. The proposed pipeline crosses these BLM lands between mileposts 0.3 and 0.6 and between mileposts 2.2 and 2.8, for a total of 0.9 miles in Kern County.

Another sensitive land use in Kern County is the Lost Hills School (milepost 31), located approximately 0.5 miles from the pipeline. The only community located less than 1 mile from the pipeline is Derby Acres. Construction of the pipeline will cause minor impacts to these sensitive land uses, including dust, noise, and traffic congestion. These impacts, however, will not be significant, since they will be short-term and will only occur during the construction period. A long-term significant effect of pipeline operation will be preventing future development of the community of Derby by creating a permanent right-of-way. This impact is minimized by aligning the pipeline parallel to existing rights-of-way as much as possible.

There are three landfills located near the proposed route in Kern County. These are the Taft Landfill, Buttonwillow Landfill, and the Lost Hills Landfill (see Table 3-27 in Section 3.2.9).

The proposed project in Kern County includes four existing booster/injection stations: the Weir, McKittrick, Kernridge, and Mid stations. A new 80-MBBL storage tank will be constructed at Mid station, in addition to access roads and energy and water supplies. New microwave towers will be constructed at McKittrick and Mid stations. These towers will be 100 and 205 feet high, respectively.

No new booster/injection stations are required and microwave towers will be built at existing facilities; therefore, no additional lands will be utilized.

County Land Use Approvals and Concerns. Local permits that are typically relevant to pipeline construction and operation are contained in zoning and floodplain ordinances, general plans, and specific development plans. Kern County requires the following permits: zoning, conditional use, building construction and grading, and electrical and plumbing. The Kern County Planning Department also requires a flood hazard evaluation and cancellation of any Williamson Act land use contracts. The Williamson Act, which was passed in 1965, was intended to preserve agricultural lands. Since no new aboveground structures are proposed, Williamson Act land use contracts do not need to be cancelled. The Public Works Department requires encroachment permits for work on highway rights-of-way, and the Air Pollution Control District requires permits to construct and operate an air emission source.

The alignment of the proposed route through Kern County is consistent with zoning designations pursuant to Sections 7259.10 and 7259.10(a) of the Kern County Zoning Ordinance, and thus the pipeline will not result in significant impacts to land use classifications. However, the proposed alignment must be submitted to the Kern County Director of Planning and Development Services for review and recommendation.

Recreational Areas/Uses. The proposed route passes within 1 mile of two county-maintained parks: Derby Acres Park and Lost Hills Park. These small parks (3.8 acres and 7.6 acres, respectively) contain barbecues, picnic tables on concrete slabs, drinking fountains, sheltered group picnic areas, playground equipment, restrooms, recreation buildings, ball diamonds, croquet courts, and horseshoe pits. No visitor use data have been compiled by the county (Coyle 1986).

Impacts to these recreational facilities during project construction are expected to be short-term, occurring for the duration of the construction period only, and will be caused by noise, dust, and traffic. Encroachment of the parks is not anticipated.

The proposed pipeline crosses the California Aqueduct just north of Lost Hills Park. The nearest fishing area, the Lost Hills Fishing Access, is located approximately 2 miles south of this location. Fishing is allowed all along the California Aqueduct, with the exception of fenced areas (Lucas 1986).

Kings County

Land Uses Along the Right-of-Way. The proposed route traverses approximately 27 miles through southwestern Kings County along I-5. Land uses traversed by the pipeline include rangeland for about 18 miles, cultivated agriculture for 9 miles, and less than 1 mile of industrial/commercial land. The pipeline is aligned parallel and adjacent to existing rights-of-way throughout its entire length (27 miles) in Kings County. Kettleman City, located on State Highway 41, 1.5 miles north of its intersection with I-5, is the only incorporated town along the proposed route in Kings County. Commercial development occurs at the point of intersection of these two highways. Kettleman City provides both a highway commercial center and an agricultural service center for the county.

Near Kettleman City, in the vicinity of the I-5 and Highway 41 interchange, the land is zoned for commercial and industrial uses. There are a number of existing pipelines and transmission lines in this area. However, construction of the proposed pipeline will cause minor disruptions (e.g., traffic noise, dust) to the motels, restaurants, and gas stations along Highway 41 (Gardner 1986). Although the construction and operation of the pipeline near existing urban areas of potential growth areas will preclude the future use of the right-of-way for urban development and will remove the land from other uses, this impact is not considered significant since the pipeline follows an existing right-of-way in this area.

BLM owns surface mineral rights in Kings County in the Kettleman Hills area which are traversed by the proposed pipeline from about mileposts 64.1 to 64.4.

Kings County maintains two landfills: the Corcoran Landfill and the Hanford Landfill (see Table 3-27 in Section 3.2.9).

No new booster/injection stations or microwave towers are proposed for Kings County in conjunction with the proposed project, and therefore, no additional lands will be utilized. The existing Kettleman booster station is the only facility in Kings County associated with the proposed project. The microwave tower at this station, with associated electronic equipment, will be 205 feet high.

<u>County Land Use Approvals and Concerns</u>. The Kings County Planning Department requires zoning, building, and structural permits. The county's Public Works Department requires encroachment permits for work on highway rights-of-way, and the Air Pollution Control District requires permits to construct and operate an air emission source. In addition, the City of Avenal Public Works Department requires an encroachment permit for projects with the potential to disrupt or conflict with roadways. No other specific pipeline concerns were identified by the county or local agencies in Kings County.

<u>Recreational Areas/Uses</u>. The Kettleman City Aquatic State Recreation Area was purchased by the state for use as an aquatic park in conjunction with the California Aqueduct. To date, the area has not been developed as a park. The land is presently owned by the California Department of Water Resources and is being used for agriculture (Hadano 1986). The County Planning Department is not aware of any specific plans for development of the park in the near future (Gardner 1986).

The Kettleman City Fishing Access area is located 0.3 miles from the proposed route (see Table 3-27 in Section 3.2.9). This area has parking and garbage facilities for fishermen and a fenced access to the California Aqueduct. Fishing is allowed all along the aqueduct with the exception of the areas that are fenced off.

<u>Fresno County</u>

<u>Land Uses Along the Right-of-Way</u>. As it enters Fresno County, the proposed pipeline parallels I-5. Between the county boundary and

Highway 33 it crosses to the west side of I-5 and proceeds to the existing Caliola station. From the Caliola station, the pipeline runs north, back to I-5. It then diverges from I-5 and runs approximately 0.5 to 1 mile west of I-5 for about 16 miles. The pipeline then parallels I-5 again and turns northwest after Panoche Junction. From there, the pipeline follows an existing Pacific Gas and Electric power line to Merced County.

In Fresno County, the pipeline traverses 18 miles of agricultural lands and 47 miles of rangeland. In the rangeland east of Coalinga in southern Fresno County, the proposed route crosses some oil-producing land. Short-term impacts to these lands, such as noise, dust, and traffic congestion, will occur during the project construction phase only, and therefore will be insignificant.

In this area, the pipeline crosses land proposed for the development of an industrial area to be developed in conjunction with the proposed Coalinga Air Cargo Port. The Coalinga Regional Plan proposes a cargo port, industrial park, and agricultural center between the Coalinga Canal and I-5. The proposed pipeline is presently aligned around the proposed air cargo complex. However, the cargo port project is expected to expand beyond the currently designated area, and as a result, the permanent pipeline right-of-way may pose an impediment to future development.

The Bureau of Reclamation owns land along the Pleasant Valley Levee which is traversed by the proposed pipeline for about 330 feet at milepost 84.6.

Two landfills are located in the general vicinity of the proposed pipeline in Fresno County. These are the Coalinga Landfill and the West American Avenue Landfill southwest of Kerman, California (see Table 3-27 in Section 3.2.9).

Booster/injection stations in Fresno County associated with the proposed project include the existing Caliola station, which will be modified, and a new station, SJV-2b, to be located at milepost 132.9 on agricultural lands. Station SJV-2b is proposed on private lands used for agriculture. The station requires 3 acres of land and the ancillary facilities (access roads, natural gas pipeline, electric transmission line, and water pipeline) require an operational right-of-way of 19.2 acres and a construction right-of-way of 38.4 acres (Woodward-Clyde Consultants 1985). A microwave repeater station with associated electronic equipment will be constructed at both the Caliola and SJV-2b stations. In addition, two other towers are proposed at Skunk Hollow and Panoche Junction. Each tower will occupy approximately 2,500 square feet of fenced area, with additional space for access and electrical service for those sites not located near a station. The microwave towers at Caliola and Skunk Hollow will be 180 feet high; those at Panoche Junction and SJV-2b will be 205 feet high. Land use in the vicinity of the proposed Skunk Hollow microwave tower is rangeland, while the area proposed for the Panoche Junction tower is agricultural.

County Land Use Approvals and Concerns. The Fresno County Department of Planning and Development Services requires the following permits: unclassified conditional use, zoning clearance, building, inspection, grading, encroachment, drainage, and road crossing. The Air Pollution Control District requires permits to construct and operate an air emission source.

Specific land use concerns of the Department of Planning and Development Services with regard to the proposed project include:

- Effects on recreational trails either on I-5 or the California Aqueduct as part of the County Regional Bikeways Plan; and

- Obtaining a conditional use permit as required by the Fresno zoning ordinance.

The alignment of the pipeline through Fresno County is generally consistent with land use regulations and plans, since the route traverses west-side rangelands, which are best suited to open space and agricultural uses. However, a potential conflict exists between the pipeline and the proposed Coalinga Air Cargo Port (Marcussen 1986).

Recreational Areas/Uses. The only recreational facilities in the area of the pipeline include a rest area along I-5 (milepost 73), which is located 0.2 miles from the right-of-way; and the Little Panoche Reservoir (milepost 136), located 0.9 miles from the pipeline. The Little Panoche Reservoir is primarily a water supply reservoir which is not intended for recreational use, although fishing is allowed. Both of these facilities will be impacted during construction by noise and dust. These impacts will not be significant, however, since they will be localized and short-term, occurring only for the duration of construction.

Fresno County's Regional Bikeways Plan designates bike trails in the county. However, no trails have been officially constructed except along the California Aqueduct. The designated trails on Los Gatos Creek and Wartham Creek, which are crossed by the pipeline right-of-way, only have occasional use; thus, pipeline construction and operation will not have a significant impact on these bikeways (Takeuchi 1986).

Merced County

Land Uses Along the Right-of-Way. In Merced County, the proposed pipeline follows an existing Texaco pipeline right-of-way until it crosses Ortigalita Creek and Highway 152. The proposed route traverses 8 miles of agricultural lands and 27 miles of rangeland. Insignificant, short-term impacts on these lands such as dust, noise, and traffic congestion will occur during the construction phases.

The pipeline traverses strictly rangeland until it passes through the Los Banos Creek Reservoir State Recreation Area. From there, it crosses cultivated farmland until it reaches the San Luis Reservoir State Recreation Area. It then bypasses O'Neill Forebay and crosses the California Aqueduct, proceeding northwest through uncultivated rangeland to the county line.

The Bureau of Reclamation owns land in Merced County associated with the Delta-Mendota Canal, the Los Banos Reservoir, and O'Neill Forebay. This Bureau of Reclamation land occurs over portions of the pipeline route between mileposts 152 and 164; approximately 3.4 miles of the pipeline route crosses Bureau of Reclamation land in Merced County.

The pipeline will be routed around the proposed United Technologies Corporation production plant, which is proposed as an extension of the Coyote Center operations. This plant is proposed for location west of I-5 near Highway 152.

There is one landfill in Merced County in the vicinity of the proposed pipeline. This is the Billy Wright Landfill, a county-maintained landfill on Billy Wright Road just west of I-5 (see Table 3-27 in Section 3.2.9).

No booster/injection stations will be built in Merced County. Two microwave repeater stations are proposed for construction at Laguna Seca Ranch and Cottonwood Hill. Each tower will occupy approximately 2,500 square feet of fenced area, and additional land (about 10 acres) will be required for access and electrical service. The Laguna Seca Ranch tower will be 130 feet high and the Cottonwood Hill tower will be 105 feet high.

County Land Use Approvals and Concerns. The Merced County Planning Department requires the following permits: land leveling/grading, building, conditional use permits, and blasting. The Public Works Department requires an encroachment permit for highway crossings and rights-of-way. The county has not specified any land use concerns related to the proposed action.

The proposed route will be consistent with land use regulations and plans, since the objectives of the Merced County Plan are to preserve the open space character of grazing lands and to maintain agricultural areas. One potential land-use conflict is with the proposed United Technologies Corporation production plant. The proposed pipeline is routed through the least sensitive portion of the site to avoid a significant impact.

Recreational Areas/Uses. Recreational facilities in Merced County in the vicinity of the proposed route include the Los Banos Creek Reservoir (milepost 154), the San Luis Reservoir State Recreation Area, the San Luis Reservoir/O'Neill Forebay (milepost 163), and the Delta Forebay Golf Club (milepost 164). The Los Banos Creek Reservoir State Recreation Area is a 2,475-acre park and reservoir which contains camping and picnicking facilities. Boating, swimming, and fishing are allowed in the reservoir. The park received 74,090 visitors in 1985 (Hadano 1986). The San Luis Reservoir State Recreation Area is a 23,551-acre park and reservoir with camping and picnicking facilities. Boating, swimming, and fishing are allowed in the reservoir and in the O'Neill Forebay. Boat ramps are located at each body of water. The California Department of Parks and Recreation recorded 490,759 visitors to the recreation area in 1985 (Hadano 1986). Impacts to these facilities during pipeline construction include noise, dust, and traffic congestion. These impacts are expected to be insignificant since they will occur only during construction.

Stanislaus County

Land Uses Along the Right-of-Way. In Stanislaus County, the proposed pipeline runs 1 to 2 miles west of I-5 until halfway between Del Puerto Canyon and Kern Canyon. At this point, the pipeline is routed adjacent to I-5. The pipeline traverses 28 miles of rangelands interspersed with about 2 miles of agricultural lands. Impacts on these lands uses, such as noise, dust, and traffic congestion, can be expected to occur temporarily during project construction and are not anticipated to be significant.

The Fink Landfill, on Fink Road near I-5, is located near the proposed route (see Table 3-27 in Section 3.2.9). The Fink Landfill is maintained by the county.

A new booster/injection station, SJV-3b, will be built in Stanislaus County at milepost 197. The station will require 29.6 acres of land during construction and 16.3 acres during operation (Woodward-Clyde Consultants 1985). A microwave repeater station with associated electronic equipment will be constructed at the new station. In addition, another microwave repeater station will be built on Mount Oso, 5.5 miles southeast of the proposed route adjacent to milepost 200. Each tower will occupy approximately 2,500 square feet. The Mount Oso tower will require additional space for access and electrical service. Both towers will be 50 feet high. Land requirements for these facilities are about 12 acres of rangeland and 4 acres of agricultural land.

County Land Use Approvals and Concerns. The proposed route through Stanislaus County will generally be consistent with land use regulations and plans since the Stanislaus General Plan designates the area along the proposed right-of-way as agricultural. The Stanislaus County Planning Commission requires the following permits: use, zoning, building, grading, and encroachment. The Fire Warden requires blasting permits and the County Council requires a franchise agreement.

Specific land use and permitting concerns of the Department of Planning and Community Development regarding the proposed project include: obtaining a use permit; and providing detailed operation and safety procedures for microwave towers. The county requires that detailed operational and safety procedures associated with the proposed towers be submitted to the county.

Recreational Areas/Uses. The only park in the general vicinity of the proposed route in Stanislaus County is the Frank Raines Regional Park and Off-Road Vehicle Park. The 3-acre park is located approximately 16 miles west of the proposed route off Del Puerto

Canyon Road. It has a day-use area with picnicking and a ball diamond, as well as a small campground.

The Westley Park Rest Stop is a well-known 11-acre rest area located in the north end of Stanislaus County off of I-5. The area contains picnic tables, restrooms, parking, and garbage facilities. The proposed pipeline route is aligned immediately adjacent to this facility and booster station SJV-3b impacts the visual resources at this site. The rest stop will be subject to noise, dust, and traffic congestion impacts during project construction. These impacts are expected to be temporary and localized.

Along the California Aqueduct there is a 31-mile bike path.

San Joaquin County

Land Uses Along the Right-of-Way. In San Joaquin County, the proposed pipeline follows Route 580, passing through uncultivated rangeland and foothills for 15 miles parallel to an existing right-of-way for its entire length. This land is zoned for agricultural use with a minimum parcel size of 160 acres. Construction through uncultivated rangeland is not expected to cause significant problems because both the existing vegetation and rural development are sparse in this area.

The proposed route will not cross any major highways or waterways. At approximately milepost 204, the proposed route crosses under the Hetch-Hetchy Aqueduct, a set of three underground water pipes which provides drinking water from the Sierra Nevada to San Francisco and other Bay Area communities.

The appropriate utility companies and agencies must be contacted for maps and further information on the water pipes. The pipes will be field-located and test pits will be dug as appropriate to determine depth and exact location. The proposed pipeline should not impact the aqueduct as long as it is constructed a minimum of 1 foot or below the aqueduct (Cooper 1986). An oil spill in the vicinity of the aqueduct would have no effect on the water unless both pipe systems ruptured simultaneously in the same place (Cooper 1986).

The proposed route passes within 1 mile of the Corral Hollow Sanitary Landfill. The landfill is close to capacity, with only four to five years of useful service remaining. The county is currently seeking a replacement landfill site.

No booster stations or microwave repeater stations will be located in San Joaquin County as part of the proposed project.

County Land Use Approvals and Concerns. The pipeline will be consistent with land use regulations and plans as the land along the proposed route through San Joaquin County is zoned predominantly agricultural. The San Joaquin County Planning Department requires conditional use, building, and subdivision permits. The Public Works Department requires encroachment or franchise permits for roadway crossings and/or right-of-ways as well as a flood hazard evaluation. The Air Pollution Control District requires permits to construct and operate an air emission source and the Sheriff's Department requires a blasting permit. Beyond fulfilling these permit requirements, no specific aspect of the proposed action elicited any concerns from the county.

Recreational Areas/Uses. The private Tracy Golf and Country Club is located next to the proposed route near Chrissman Road. It covers 140 acres and has 210 members. The Carnegie State Vehicle Recreation Area is located several miles west of the proposed route off Corral Hollow Road. This is a 1,500-acre day-use facility with trails for off-road vehicle use. Picnic tables are also available. Impacts to these facilities during project construction will include noise, duct, and traffic congestion. These impacts are expected to be temporary, localized, and insignificant.

Alameda County

Land Uses Along the Pipeline Right-of-Way. The proposed route enters the northeast corner of Alameda County along the west side of Interstate 580, and crosses under Interstate 580 where the highway turns west. It then continues in a northwest direction through land designated by the Livermore-Amador Valley Planning Unit of the Alameda County General Plan as 100-acre minimum agricultural. The proposed route follows an existing utility easement at the base of the foothills on the east side of the Diablo Range.

In Alameda County, the pipeline traverses 5 miles of rangeland/open space. The pipeline through this area follows existing rights-of-way for its entire length. Construction through the rangeland/open space is not expected to cause significant problems because the existing vegetation and rural development are sparse.

The California-Oregon Transmission Project is a proposed 500-kilovolt power line that would extend from the Oregon border to the Tesla substation in Alameda County. Proponents of this project have identified the proposed pipeline route as also being the preferred route for the power line, though it could also use one of three other routes east of the proposed pipeline. This transmission project is currently undergoing environmental evaluation. If approved, construction would begin in 1988. Conflict between the two projects is unlikely because the transmission project would be above-ground and would require little excavation.

The proposed route passes approximately 3 miles northeast of the Altamont Sanitary Landfill (see Table 3-27 in Section 3.2.9).

No booster/injection stations or microwave repeater towers will be located in Alameda County as part of the proposed project.

County Land Use Approvals and Concerns. The Alameda County Planning Department requires conditional use and grading permits; amendments to the land conservation contract; and approval of conformance with the county general plan. The Public Works Department requires encroachment permits for highway crossings and right-of-ways, a flood control permit, and a seismic and geological evaluation. The Fire

Department requires a permit for blasting. Because the proposed pipeline is routed through a remote corner of Alameda County, the Planning Department did not have any specific concerns about the project.

The proposed action will be consistent with land use regulations because the land use along the proposed pipeline route is agriculture. The zoning along the pipeline route is 100-acre minimum agriculture, but because the project will be an easement, it will be consistent with this zoning designation (Allen 1986). One potential conflict identified by the Alameda County Planning Department is the proposed California-Oregon Transmission Project, a 500-kilovolt power line that would extend from the Oregon border to the Tesla substation in Alameda County.

Recreational Areas/Uses. The proposed pipeline route is routed around the western edge of Bethany Reservoir in Alameda County, but crosses the western edge of the Bethany Reservoir State Recreational Area. The recreation area is 300 acres and contains picnicking and fishing facilities. The park received 16,575 visitors in 1985 (see Table 3-26 in Section 3.2.9). Construction impacts on this recreation area will include noise, dust, and traffic congestion. Although these impacts will inconvenience recreationists, they will be temporary and insignificant disturbances. Operation of the pipeline system will result in the removal of about 2 acres of land from recreational use; this impact on land use is considered significant.

Contra Costa County

Land Uses Along the Right-of-Way. In Contra Costa County, the pipeline traverses 1 mile of agricultural lands, 23 miles of rangeland, 3 miles of industrial/commercial development, and 10 miles of shrubland/woodland. For 35 of the 37 miles, the proposed pipeline continues to follow an existing utility easement into the southeast corner of Contra Costa County. Traveling first in a northwesterly direction, the pipeline turns almost due west just south of Pittsburg and Antioch, continuing in this direction until reaching the pipeline's terminus in Martinez.

Construction and operation impacts are not expected in the rangeland area, since existing vegetation and rural development are sparse in this area. According to the East County Area General Plan, future development of this area is unlikely over the next 20 to 30 years. Construction of the pipeline in wooded areas will result in long-term aesthetic impacts. After the completion of construction, 50 feet of the 80-foot work space will be allowed to revegetate naturally. The remaining 30-foot-wide area will be maintained in a cleared condition as a permanent right-of-way.

Except for the heavily industrialized Pittsburg-Antioch area, most of eastern Contra Costa County has historically been agricultural. However, although agriculture continues to be the predominant land use, the area east of Concord, along the Highway 4 corridor to Antioch, Oakley, and Brentwood, is being increasingly developed for urban uses.

Numerous residential developments are proposed or have been approved just north of the project corridor, including a 15,000-housing-unit development in Southeast Antioch, and a total of about 2,200 single-family homes and apartments in West Pittsburg, Pittsburg, and Antioch (Contra Costa County 1986). Proposed developments that would be traversed by the pipeline route in this area include the Sky Ranch single-family subdivision; the Oak Hills single-family planned unit development (PUD); a 2.5-million-gallon above-ground water storage tank; and a 3,000-acre-foot dam and reservoir (Lefler 1986). These planned developments may conflict with the proposed project. Construction impacts can be minimized by coordinating construction schedules and ensuring that the pipeline will not cross existing or planned homes.

The City of Brentwood is seeking to limit the number of exclusive rights-of-way in order to allow for orderly development of the area. The pipeline is aligned approximately 3 miles from the city. The pipeline would significantly impact future development since a permanent right-of-way would be established; however, other lands in the region are available for development and the pipeline route is not adjacent to the city boundaries.

Several other construction projects are proposed at locations near or adjacent to the pipeline route. The East Contra Costa County Airport is proposed to be built in the southeastern part of the county; the pipeline route follows the western edge of the property line proposed for the airport.

The county is also proposing a series of sanitary landfills to address an anticipated shortage of solid waste disposal sites by the late 1980s. These landfill sites, the Kirker Pass project and the Central Landfill complex (which includes three separate sites), are proposed to be built in the north-facing foothills of the Diablo Range. Part of the area of these landfills lies within the proposed pipeline right-of-way, which would significantly impact future landfill expansions.

Finally, CalTrans, in conjunction with Contra Costa County, proposes to lower and widen Highway 4 between Concord and West Pittsburg, pending the availability of necessary funding (Contra Costa County 1984). The proposed route crosses Highway 4 near Willow Pass Summit, within the stretch of Highway 4 scheduled for improvements. Land use conflicts will be minimized if construction schedules are coordinated and the compatibility of the proposed project and highway widening is investigated.

No booster/injection stations are proposed for Contra Costa County in conjunction with the proposed project. Two microwave repeater stations are proposed for construction at Mount Diablo and the Martinez refinery. Each tower will occupy approximately 2,500 square feet of fenced area with additional space required for access and electrical service. The Mount Diablo tower will be 50 feet high and will be built near the summit. The Martinez refinery tower will be 80 feet high. The land requirements constitute only about 1 acre since access roads are available.

County Land Use Approvals and Concerns. The Contra Costa Planning Department requires structural permits. The County Building and Grading Department issues electrical and plumbing as well as grading and building permits. The Public Works Department is responsible for approving or denying drainage permits and granting permission for stream and county road crossings. The Flood Control Department requires flood control and encroachment permits, while the County Supervisor issues blasting permits.

The pipeline route is not entirely compatible with existing land use plans and development proposals. Specific land use and permitting concerns expressed by the various agencies and municipalities of Contra Costa County with regard to the proposed project are summarized below:

- The Contra Costa Water District (CCWD) is concerned about impacts to the proposed Los Vaqueros/Kellogg Reservoir project in the southeastern part of the county. In addition, the pipeline route between Antioch and Martinez crosses the Contra Costa Canal, which is operated and maintained jointly by CCWD's Water Supply Division and the Bureau of Reclamation. The pipelines for the canal belong to CCWD's Treated Water Division.

- The City of Martinez is concerned about the terminus point of the pipeline in relation to Highway 680. Several pipelines are currently aligned along Waterfront Road and are posing problems with rebuilding this road and CalTrans' plans for rebuilding the I-680 interchange. The city is also interested in obtaining detailed information on the location of the Martinez microwave station.

- The City of Brentwood would like the issue of impacts on future development in the city addressed. The city is seeking to limit the number of exclusive right-of-ways in order to allow for orderly development of the area.

- The City of Antioch is concerned that the proposed route crosses an existing and proposed solid waste landfill site and areas planned for residential development.

- The City of Pittsburg is concerned about the impacts of the pipeline on the proposed Sky Ranch residential development, which is a 300+ single-family subdivision proposed for the southeast corner of the city. Also planned for the southeast corner of the city is the Oak Hills residential development, a single-family apartment planned unit development. In addition, the city is proposing a 2.5-million-gallon above-ground tank west of the PG&E transmission line. A 3,000-acre-foot dam and reservoir is proposed west of the water tank.

- The Contra Costa Department of Parks and Recreation has a project northwest of the City of Byron, i.e., the John Marsh Home, which may be affected by the proposed pipeline. The building is a sandstone house built in the 1850s which the county is restoring. It is located on Marsh Creek Road 5 miles southwest of Brentwood. The Department has requested more detailed information and maps of the proposed pipeline route and its alternatives in order to evaluate the potential impacts of the project on this facility.

Recreational Areas/Uses. There are three recreation areas in the vicinity of the proposed pipeline route: the Contra Loma Regional Park, Black Diamond Mines Regional Preserve, and Stoneman Park. The proposed pipeline crosses the Black Diamond Mines Regional Preserve, a 3,400-acre, rugged park with a well-developed system of hiking trails. The East Bay Regional Park District owns this land and also manages recreational use of the Contra Loma Reservoir. Removal of land from recreational use is considered a significant impact. In addition, significant impacts to these recreational areas could result from a pipeline rupture. The directors of the East Bay Regional Park District have noted that an oil pipeline rupture occurred in the Black Diamond Mines Regional Preserve several years ago as a result of heavy rains and massive landsliding. This pipeline was rerouted outside of park property as a result of the spill (Lindenmeyer 1986).

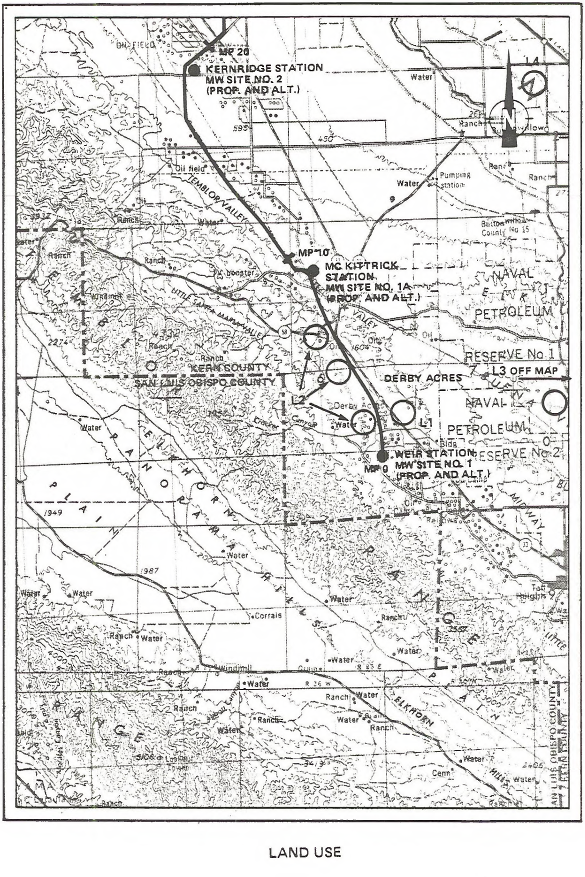
The Contra Loma Regional Park covers 776 acres and contains an 83-acre lake. The park is for day use only and contains swimming, picnicking, and hiking facilities. Stoneman Park is owned by the Department of the Interior but managed by the City of Pittsburg (Bedell 1986).* The proposed pipeline traverses the area adjacent to the park and the John Marsh Home, both of which will be affected by temporary dust, noise, and traffic congestion during project construction.

---

*Land ownership maps for the pipeline do not show any land owned by DOI adjacent to the proposed route in this area.

MAP 1 LEGEND: SENSITIVE LAND USES

Code	Impact	Location	Description
L1	Potential disruption of park activities	Derby Acres, MP 1	Town of Derby Acres and Derby Acres Park
L2	Potential disruption of range management	MP 2, 5, 8	BLM Lands
L3	Reduction in landfill capacity	Taft	Taft Landfill
L4	Reduction in landfill capacity	North of Buttonwillow	Buttonwillow Landfill

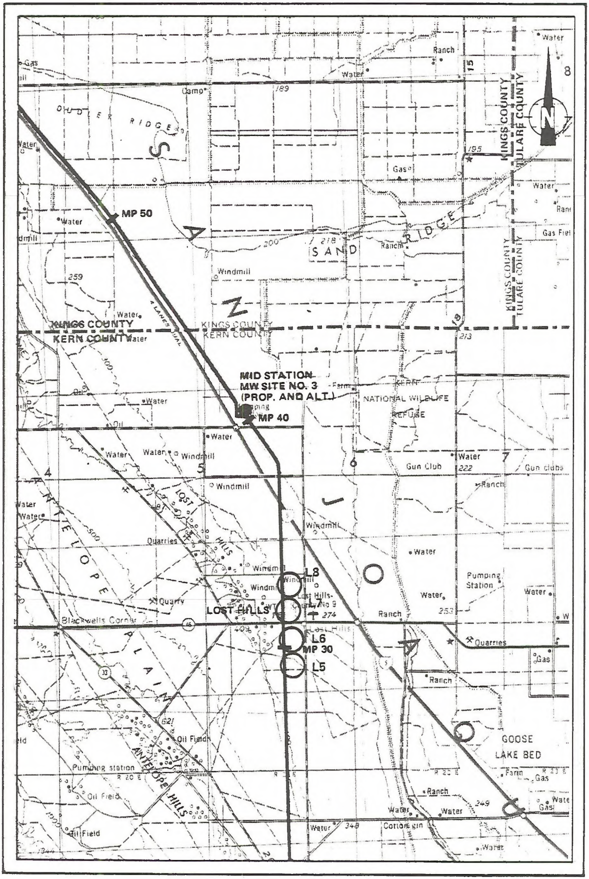


LAND USE

MAP 1

MAP 2 LEGEND: SENSITIVE LAND USES

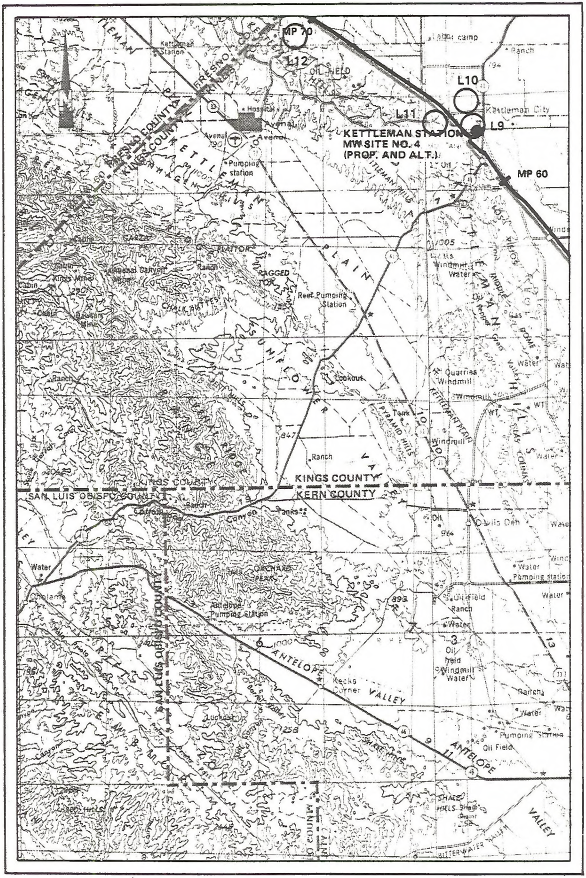
Code	Impact	Location	Description
L5	Disruption of recreation activities	Lost Hills	Lost Hills Fishing Access
L6	Construction noise	Lost Hills, MP 31	Lost Hills School
L7	Disruption of park activities	Lost Hills	Lost Hills Park
L8	Reduction in landfill capacity	Lost Hills	Lost Hills Landfill


MP 50
KINGS COUNTY
KERN COUNTY
MID STATION
MW SITE NO. 3
(PROP. AND ALT.)
MP 40
L8
LOST HILLS
L6
MP 30
L5
SAND RIDGE
DUDLEY RIDGE
KINGS COUNTY
TULARE COUNTY
NATIONAL WILDLIFE REFUGE
GOOSE LAKE BED
ANTELOPE PLAIN
ANTELOPE HILLS
Blackwells Corner
N

MAP 2

MAP 3 LEGEND: SENSITIVE LAND USES

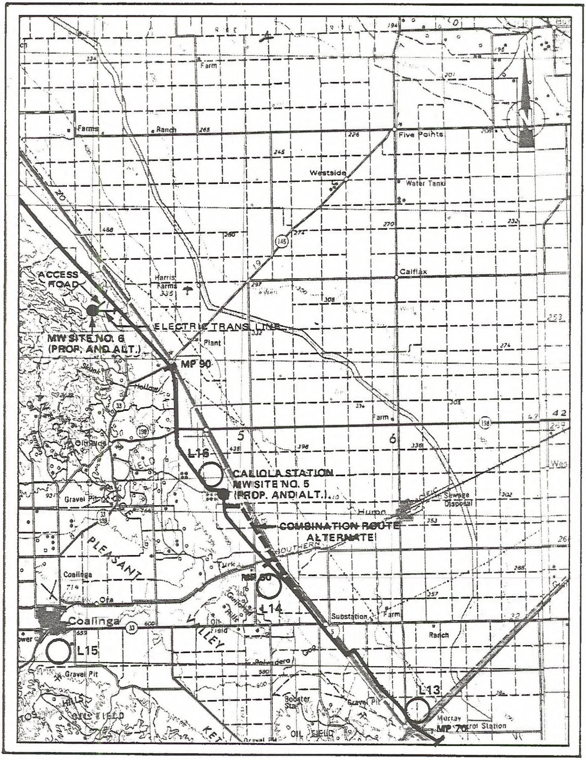
Code	Impact	Location	Description
L9	General construction impacts	MP 63, east of California Aqueduct	Town of Kettleman City
L10	No impact; land use feature only	MP 61-63	Industrial/Commercial Area
L11	General construction impacts	Adjacent to California Aqueduct	Kettleman City Fishing Area
L12	Disruption of range management activities	MP 70	BLM Land


MP 70
L12
L10
L11
L9
KETTLEMAN STATION
MW SITE NO. 4
(PROP. AND ALT.)
MP 60
KINGS COUNTY
KERN COUNTY
SAN LUIS OBISPO COUNTY
FRESNO COUNTY
Kettleman City
Avenal
Pumping station
Reef Pumping Station
Lookout
Ranch
Antelope Pumping Station
Kecks Corner
ANTELOPE VALLEY
Devils Den
Cholame
Oil Field

MAP 3

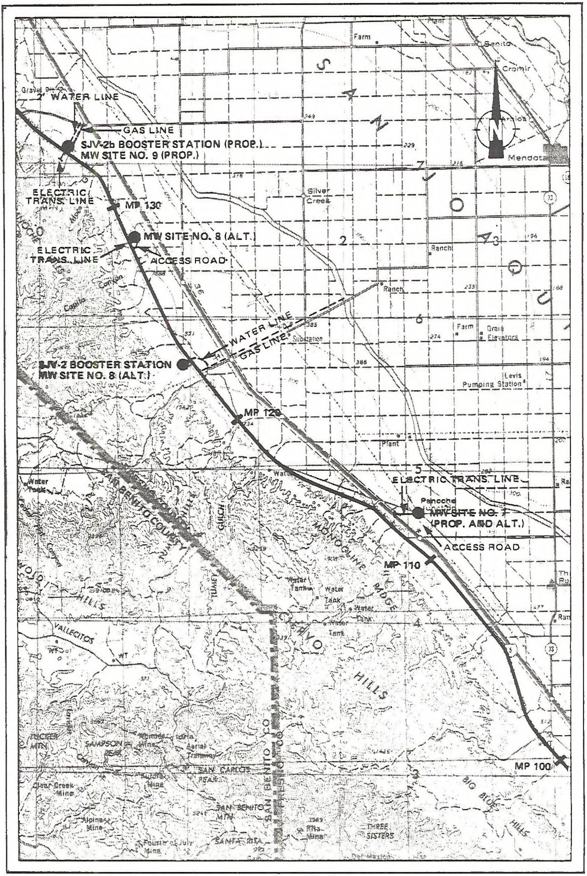
MAP 4 LEGEND: SENSITIVE LAND USES

Code	Impact	Location	Description
L13	Not crossed; general construction impacts	I-5 near boundary between Kings and Fresno counties	Interstate 5 Rest Area
L14	Potential impediment to expansion	Between Coalinga Canal and I-5 and Dorris Avenue and Los Gatos Creek	Proposed Coalinga Air Cargo Port
L15	Reduction in landfill capacity	South of Coalinga	Coalinga Disposal Site
L16	No identified land use impact	Adjacent to present Caliola pumping station site	Bureau of Reclamation Land


ACCESS ROAD
MW SITE NO. 6 (PROP. AND ALT.)
ELECTRIC TRANS. LINE
MP 90
L16
CALIOLA STATION MW SITE NO. 5 (PROP. AND ALT.)
COMBINATION ROUTE ALTERNATE
L14
L15
L13
MP 70
Five Points
Westside
Calflax
Huron
Coalinga
PLEASANT
VALLEY
Water Tank
Harris Farms
Plant
Farm
Ranch
Substation
Gravel Pit
Sewage Disposal
OIL FIELD

MAP 4

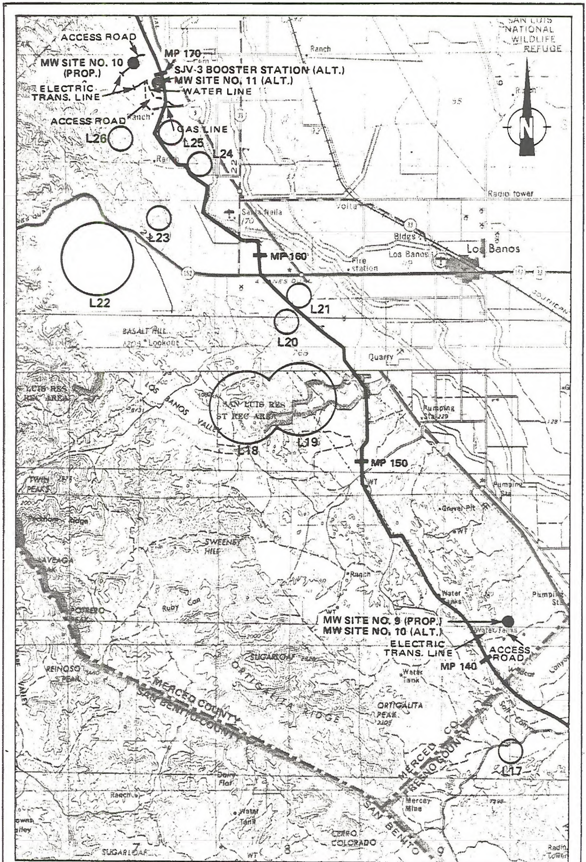
MAP 5 HAS NO LEGEND


2" WATER LINE
GAS LINE
SJV-2b BOOSTER STATION (PROP.)
MW SITE NO. 9 (PROP.)
ELECTRIC TRANS. LINE
MP 130
MW SITE NO. 8 (ALT.)
ELECTRIC TRANS. LINE
ACCESS ROAD
WATER LINE
GAS LINE
SJV-2 BOOSTER STATION
MW SITE NO. 8 (ALT.)
MP 120
ELECTRIC TRANS. LINE
MW SITE NO. 7
(PROP. AND ALT.)
ACCESS ROAD
MP 110
MP 100
SAN JOAQUIN
Mendota
Silver Creek
Levis Pumping Station
Panoche
SAN BENITO COUNTY
MONOCLINE RIDGE
CIERVO HILLS
BIG BLUE HILLS
SAN BENITO CO
SAN CARLOS PEAK
SAN BENITO MTN
THREE SISTERS
SAMPSON PEAK

MAP 5

MAP 6 LEGEND: SENSITIVE LAND USES

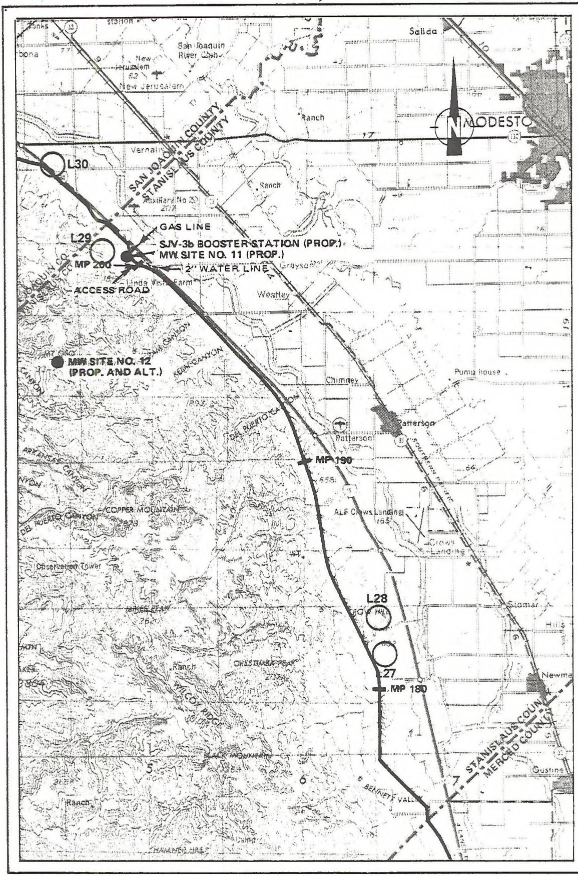
Code	Impact	Location	Description
L17	Not crossed; general construction impacts	South of Merced-Fresno County line, 1 mile MP 136	Little Panoche Reservoir
L18	Disruption of recreational activities by general construction impacts	West of I-5, south of State Highway 152	San Luis Reservoir State Recreation Area
L20	Potential impact from oil spill on water resource (Los Banos Reservoir) and California Aqueduct	MP 152	Bureau of Reclamation Land
L21	Landfill capacity reduction	Billy Wright Road, south of intersection of I-5 and State Highway 152	Billy Wright Landfill
L22	Potential disruption of recreational activities by general construction impacts	South of State Highway 152, 5 miles west of I-5	San Luis Reservoir
L23	Potential disruption of recreation activities by general construction impacts	North of State Highway 152 and adjacent to I-5	O'Neill Forebay
L24	Not crossed; general construction impacts	MP 163	Delta Forebay Golf Club
L25	Possible impediment to industrial plan	Adjacent to I-5, south of the San Luis Reservoir	United Technologies Corporation Proposed Production Plant
L26	Potential impact from oil spill on water resources (Delta Mendota Canal, California Aqueduct)	Various parcels between MP 158 and 169	Bureau of Reclamation Lands


ACCESS ROAD
MW SITE NO. 10 (PROP.)
ELECTRIC TRANS. LINE
ACCESS ROAD
MP 170
SJV-3 BOOSTER STATION (ALT.)
MW SITE NO. 11 (ALT.)
WATER LINE
GAS LINE
SAN LUIS NATIONAL WILDLIFE REFUGE
N
L26
L25
L24
L23
L22
L21
L20
L19
L18
L17
MP 160
Los Banos
BASALT HILL
SAN LUIS RES ST REC AREA
LOS BANOS VALLEY
MP 150
TWIN PEAKS
SWEENEY HILL
MW SITE NO. 9 (PROP.)
MW SITE NO. 10 (ALT.)
ELECTRIC TRANS. LINE
ACCESS ROAD
MP 140
MERCED COUNTY
SAN BENITO COUNTY
MERCED CO.
FRESNO COUNTY
ORTIGALITA RIDGE
ORTIGALITA PEAK
CERRO COLORADO
SUGARLOAF

MAP 6

MAP 7 LEGEND: SENSITIVE LAND USES

Code	Impact	Location	Description
L27	Potential impact from oil spill on water resources (Delta Mendota Canal, California Aqueduct)	Various parcels between MP 158 and 169	Bureau of Reclamation Lands
L28	Reduction in landfill capacity	West of I-5 near Crow Hill	Fink Landfill
L29	Potential disruption of rest stop use by general construction impacts	I-5 Rest Area	Westley Rest Stop
L30	Potential water pollution in case of spill	MP 204	Hetch-Hetchy Aqueduct

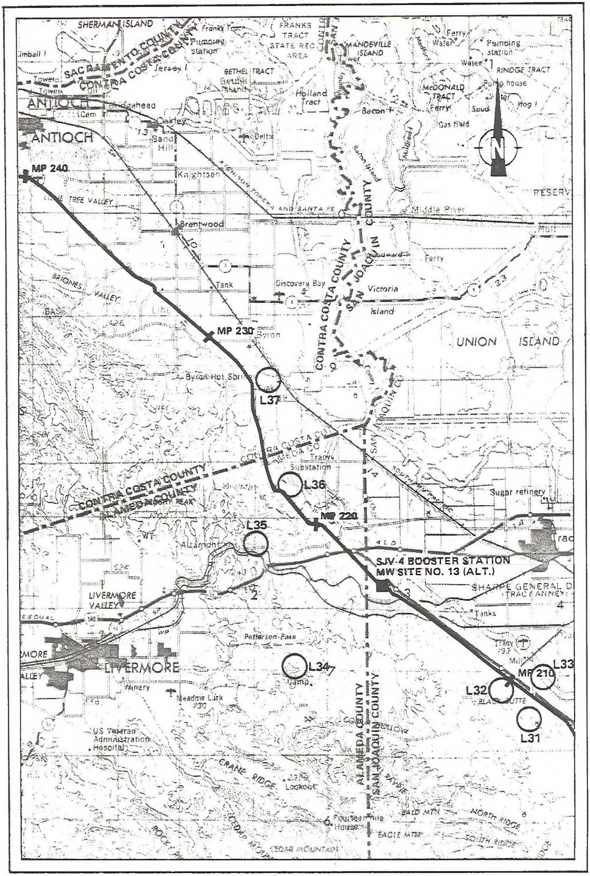


MODESTO
Salida
San Joaquin River Club
New Jerusalem
Vernalis
Ranch
SAN JOAQUIN COUNTY
STANISLAUS COUNTY
L30
L29
GAS LINE
SJV-3b BOOSTER STATION (PROP.)
MW SITE NO. 11 (PROP.)
MP 200
2" WATER LINE
ACCESS ROAD
Linda Vista Farm
Grayson
Westley
MW SITE NO. 12
(PROP. AND ALT.)
Chimney
Pump house
Patterson
MP 190
COPPER MOUNTAIN
DEL PUERTO CANYON
ALF Crows Landing
Crows Landing
Observation Tower
L28
L27
MP 180
Newman
Gustine
STANISLAUS COUNTY
MERCED COUNTY
BLACK MOUNTAIN
ORESTIMBA PEAK
Ranch

MAP 7

MAP 8 LEGEND: SENSITIVE LAND USES

Code	Impact	Location	Description
L31	Potential impediment to urban development	5 miles southwest of Tracey, adjacent to I-580	Proposed Carnegie New Town Site
L32	Potential impediment to development of land-fill	5 miles southwest of Tracey, adjacent to I-580	Proposed Landfill in Carnegie New Town Site
L33	Disruption of recrea-tion activities by general construction impacts	North of I-580 near airport	Tracey Golf Course and Country Club
L34	Disruption of recrea-tion activities	Between I-580 and Livermore	Carnegie State Vehicle Recreation Area
L35	Reduction in landfill capacity	Altamont	Altamont Sanitary Land-fill
L36	Disruption of recreation activity, crossing in-volves land requirements for right-of-way	Northeast corner of Alameda County, MP 222	Bethany Reservoir State Recreation Area
L37	Potential impingement or a conflict with land use plans	3 miles South of Byron, MP 226	Proposed East Contra Costa County Airport.


SHERMAN ISLAND
SACRAMENTO COUNTY
CONTRA COSTA COUNTY
FRANKS TRACT STATE REC. AREA
MANDEVILLE ISLAND
BETHEL TRACT
Holland Tract
McDONALD TRACT
RINDGE TRACT
Pumping station
ANTIOCH
Bridgehead
Oakley
Sand Hill
Delta
Knightsen
Bacon
Gas field
MP 240
LONE TREE VALLEY
Brentwood
Middle River
RESERV
Ferry
Discovery Bay
Victoria Island
Tank
BRIONES VALLEY
MP 230
Byron
UNION ISLAND
CONTRA COSTA COUNTY
SAN JOAQUIN COUNTY
Byron Hot Springs
L37
Tracy Substation
L36
CONTRA COSTA COUNTY
ALAMEDA COUNTY
Sugar refinery
MP 220
L35
Altamont
SJV-4 BOOSTER STATION
MW SITE NO. 13 (ALT.)
SHARPE GENERAL DEPOT TRACY ANNEX
Tanks
LIVERMORE VALLEY
LIVERMORE
Patterson Pass
L34
Camp
Winery
Meadow Lark
L33
MP 210
L32
BLACK BUTTE
L31
US Veterans Administration Hospital
ALAMEDA COUNTY
SAN JOAQUIN COUNTY
CRANE RIDGE
Lookout
Fourteenmile House
BALD MTN
NORTH RIDGE
EAGLE MTN
SOUTH RIDGE
CEDAR MOUNTAIN
N

MAP 8

MAP 9 LEGEND: SENSITIVE LAND USES

Code	Impact	Location	Description
L38	Disruption of park activities by construction	South of Pittsburg	Contra Loma Regional Park
L39	Disruption of park activities by construction	South of Pittsburg	Black Diamond Mines Regional Preserve
L40	Potential impediment to residential development	City of Pittsburg	Proposed Sky Ranch Residential Development
L41	Potential land use conflict	City of Pittsburg	Proposed Raw Water Reservoir
L42	Potential impediment, park proposals	City of Pittsburg	Stoneman Park and Reservoir
L43	Local concern over feature	City of Pittsburg, west of PG&E transmission line	Existing Water Tank
L44	Impediment to development of planned landfills	Kirker Pass between the cities of Concord and Pittsburg	Kirker Pass Landfill
L45	Potential impediment to residential development	City of Pittsburg	Proposed Oak Hills Residential Development
L46	Potential conflict with present use	East of the City of Concord	Concord Naval Weapons Center

MARTINEZ METER STATION
MP 257.6
MP 250
MW SITE NO. 14 (PROP.)
MW SITE NO. 15 (ALT.)
L43
L46
L41
CONTRA LOMA ROUTE ALTERNATIVE
L45
L44
L38
L42
L40
L39
CONCORD
WALNUT CREEK
VALLEJO
Benicia
Martinez
Pleasant Hill
Clayton
Danville
Orinda
Moraga
SAN LEANDRO
MW SITE NO. 13 (PROP.)
MW SITE NO. 14 (ALT.)
ACCESS ROAD
MT DIABLO STATE PARK
EAGLE PEAK STATE GAME REFUGE
SOLANO COUNTY
CONTRA COSTA COUNTY
NAPA COUNTY
ALAMEDA COUNTY
Grizzly Island
Simmons Island
Wheeler Island
Roe Island
Port Chicago
Shore Acres

MAP 9

APPENDIX D

CLIMATE AND METEOROLOGY

The climate of the San Joaquin Valley Air Basin is characterized by hot dry summers and cool winters with some rain. The presence of the "Pacific High," a semi-permanent subtropical high pressure belt off the California coast, tends to prevent the passage of major storms and region-wide precipitation during the summer months, and from time to time during the winter. The topography of the basin, which has gaps allowing the unimpeded passage of air into and out of the region only at its north end, constitutes an effective trap for stagnant air.

The climate of Alameda and Contra Costa counties is affected by a large influx of marine air and an associated subsidence inversion,* which is usually present at elevations of 1,000 to 3,000 feet. The subsidence inversion is produced by high pressure offshore that drives onshore winds. These winds provide consistent ventilation. The subsidence and the associated winds are persistent except during the fall or spring when their reduced strength allows Central Valley temperatures to rise.

During the summer, the Pacific high-pressure cell is usually centered west of the northern California coast, resulting in northward diversion of moisture-laden storm systems. The high pressure also produces strong onshore pressure gradients and deep penetration of marine air through the Carquinez Strait into the Central Valley. Consequently, daytime temperatures are generally cooler in the north end of the valley than in the south. Thunderstorms occur on a few days each summer due to the advection of tropical air at mid and high levels. Relative humidity in the valley is usually quite low, resulting in large diurnal shifts from incoming to outgoing radiation. This shift is accompanied by large diurnal temperature variations.

During the fall, diminishing solar intensity results in lower daytime surface temperatures, weakening the thermal trough** in the valley. The result is a negligible influx of marine air and significant air stagnation.

The Pacific high shifts south during the winter, allowing storms into the San Joaquin Valley. These can stagnate and deepen off the coast, resulting in several days of rainy weather. Days of mild, sunny weather caused by a buildup of pressure in the interior of California are interspersed with these storms. The Great Basin High develops during the winter and can cause dry, bright days in the San Joaquin Valley, or if weak, can cause extensive, persistent fog.

---

*A stable layer of air limiting upward dispersion. The inversion is characteristic of high pressure systems and is produced by the subsidence of cold upper air which is a maximum at the high pressure center.

**The "thermal trough" is a low-pressure feature that persists over excessively warm surfaces. It is caused by thermally buoyant updrafts.

Ventilation conditions below the inversion base are usually poor at these times.

Frontal systems are often weak at these latitudes, and consequently, during their slow approach, surface winds and vertical mixing may be light, resulting in stagnant conditions persisting from 12 to 48 hours.

Temperature, precipitation, severe weather, wind, and visibility data for the proposed project area are discussed below.

Temperature

Winter temperatures in the San Joaquin Valley are mild but can occasionally drop below freezing. Variations in temperature along the valley are generally small in the winter, but during the summer the northern end is markedly cooler because of the stronger effects of the sea breeze. Low relative humidity in the summer causes large diurnal temperature changes. Summer daytime temperatures often exceed 100°F, while nighttime temperatures can drop into the upper 50s. Alameda and Contra Costa counties are cooler due to the influx of marine air, with moderate temperature fluctuations. Conditions are mild, with a small daily annual temperature range (see Table D-1).

Precipitation

Precipitation in the San Joaquin Valley comes primarily from mid-latitude winter storm systems. The valley is at the southern edge of the storm belt, and thus there is a marked decrease in mean precipitation southward in the valley. This variation is also brought on by the Tehachapi Mountains, which shield the southern end of the valley from southerly, rain-bearing winds. Most precipitation in California occurs from December through April. Although occasional thunderstorms move into the San Joaquin Valley from the Sierra Nevada during the summer, precipitation is generally limited to a few hundredths of an inch during July and August. During the arid summer, dust storms can occur. Mean precipitation for areas near the proposed route is presented in Table D-1.

Severe Weather Conditions

Severe weather conditions which affect the San Joaquin Valley include high winds, thunderstorms, and funnel clouds. Thunderstorms generally occur a few days each summer. During the winter, storms which develop in the Gulf of Alaska occasionally stagnate and deepen off the California coast, causing rainy weather, flooding, and high wind conditions. The northern portions of the San Joaquin Valley are subject to stronger sea breeze effects than those found to the south. Arid conditions in the spring and summer have occasionally led to severe dust storms. However, because most of the agricultural areas are irrigated, the tilled soil surfaces are somewhat protected from severe dust entrainment. Funnel clouds are a rarity in California, and only one or two tornados are reported each year.

Table D-1

TEMPERATURE AND PRECIPITATION IN VICINITY OF PROJECT

		Jan.	Feb.	March	April	May	June	July	Aug.	Sapt.	Oct.	Nov.	Dec.	Annual
Bakersfield Airport	Temperature	47.4	52.0	56.9	63.0	70.4	77.1	84.3	81.7	76.7	66.8	55.9	48.8	65.1
	Precipitation	1.17	1.14	1.06	.81	.22	.09	.01	T	.08	.32	.49	.97	6.36
Coalinga	Temperature	45.8	50.0	54.3	60.9	67.6	74.7	81.9	79.6	74.6	65.0	54.1	47.3	63.0
	Precipitation	1.39	1.62	1.09	.59	.28	.10	.03	.01	.08	.24	.55	1.30	7.28
Freano	Temparatura	46.1	50.5	55.0	61.3	68.2	74.7	81.3	78.9	74.2	64.6	53.8	47.0	63.0
	Pracipitation	2.03	2.19	1.96	1.14	.30	.07	T	.01	.10	.43	.95	1.97	11.14
Los Banos	Tamperatura	45.6	50.1	54.9	60.9	66.8	72.8	78.8	.01	.10	.43	.95	1.97	62.0
	Pracipitation	1.63	1.58	1.35	.87	.31	.02	T	.01	.13	.44	.78	1.61	8.74
Modesto	Temperatura	45.0	49.3	53.9	59.6	65.5	71.2	76.3	74.0	70.8	62.6	52.3	46.0	60.5
	Precipitation	2.27	2.11	1.82	1.26	.49	.07	.02	.01	.10	.58	.94	2.41	12.17
Stockton	Temperatura	44.7	49.0	53.7	59.7	66.2	72.8	78.2	76.2	72.7	64.0	53.0	45.9	61.3
	Precipitation	2.55	2.46	2.05	1.14	.44	.07	.01	T	.19	.63	1.17	2.66	13.37
Livermore	Tamperature	46.1	49.9	52.4	56.9	61.9	67.0	71.7	70.8	69.5	62.6	53.4	47.5	59.1
	Precipitation	3.01	2.67	1.94	1.13	.49	.10	.01	.02	.12	.59	1.46	2.86	14.40
Berkeley	Temperatura	4.94	51.9	54.0	55.9	58.3	61.0	61.5	61.6	63.4	61.3	56.2	51.2	57.1
	Precipitation	4.68	3.91	3.19	1.68	.81	.18	.01	.04	.22	1.17	2.19	4.30	22.38

Notes: Averages computed from data for tha period 1931-1960. Tamperature is in °F, precipitation in inches.

___ Indicates the monthly maximum and minimum over the yaar.

Source: National Oceanic and Atmospheric Adminiatration 1975.

Wind

Annual average wind directions, by stability class, for three stations in the project region are presented in the wind roses in Figures D-1 to D-6. Data for these figures were obtained from the National Climatic Center in North Carolina. Bakersfield and Fresno generally experience northwesterly prevailing winds, while the prevailing wind at Fairfield is southwesterly, due to the division of airflow as the prevailing westerlies and the summer sea breezes come out of the San Francisco Bay Area.

During winter, ground level temperature inversions can persist over the San Joaquin Valley for several weeks and air movement is virtually absent for long periods. Table D-2 summarizes mixing depths in the project region. It is apparent from these data that the worst conditions for vertical mixing occur during winter.

Visibility

Visibility in the San Joaquin Valley is poor, with seasonal means as low as 7 miles. Visibility reaches a minimum in the fall, with a mean of 7 miles in central and southern areas of the valley. This improves to an average of 15 miles in the winter, and 15 to 25 miles in the spring and summer. However, during the summer, dust storms can also decrease visibility.

Fog is a contributing factor to poor visibility in the winter. Bakersfield records shown an average of 20 days of heavy fog each winter. The primary cause of the lower mean seasonal visibilities, however, appears to be air quality variations. Sulfate and nitrate concentrations peak during the fall and winter, partly because of transport from the San Francisco Bay, which also has peak concentrations of these substances during the same period. Relative humidity is higher in the fall and winter, while air stagnation is worse. Both conditions contribute to higher rates of formation of secondary pollutants (including acidic aerosols).

Visibility conditions are poorest for Alameda and Contra Costa counties during the fall. The primary causes seem to be high aerosol concentrations and stagnant air conditions. Table D-3 summarizes visibility data for selected locations in the project region.

Figure D–1

FRESNO SIR TERM SURFACE DATA (1960-64)

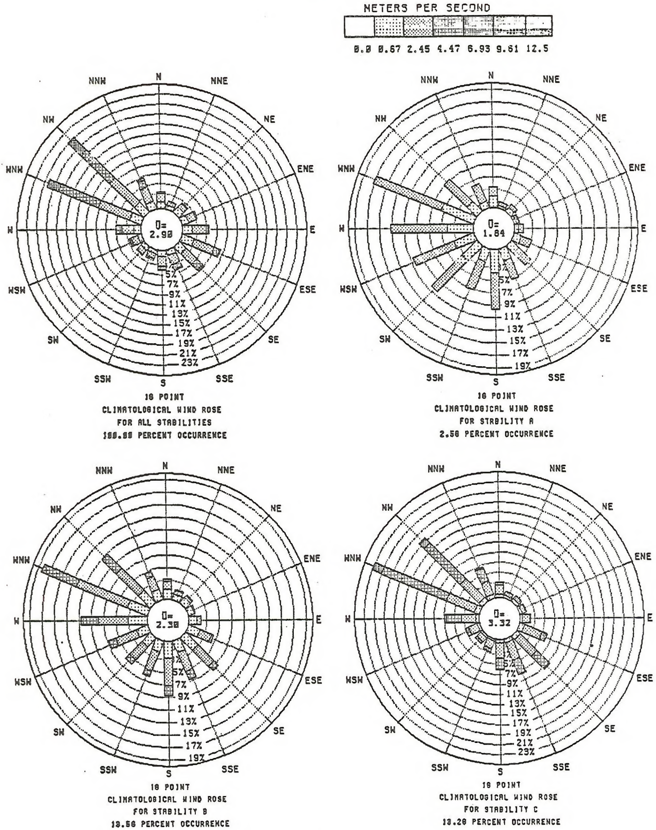
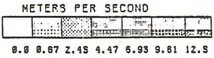
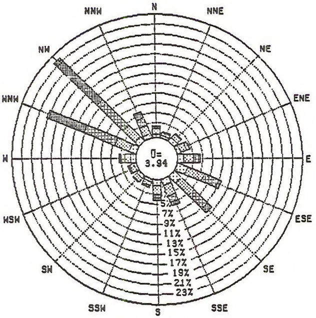


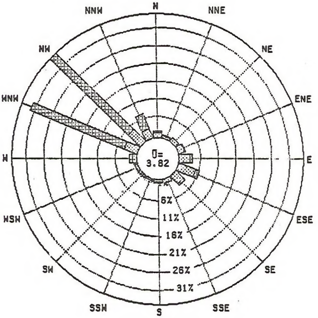
Figure D–2

FRESNO SIR TERM SURFACE DATA (1960-64)

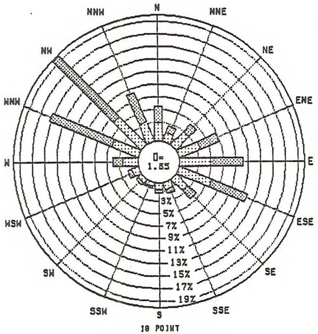




16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY D
27.44 PERCENT OCCURRENCE

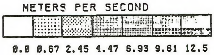


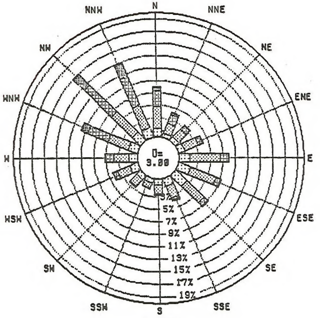
16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY E
14.19 PERCENT OCCURRENCE



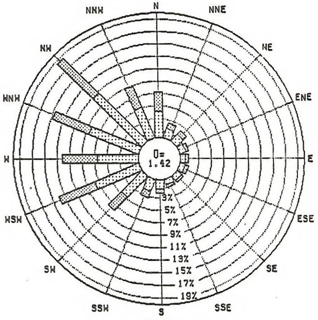
16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY F
26.86 PERCENT OCCURRENCE

Figure D-3
BAKERSFIELD/MEADOW SURFACE DATA (1960-64)

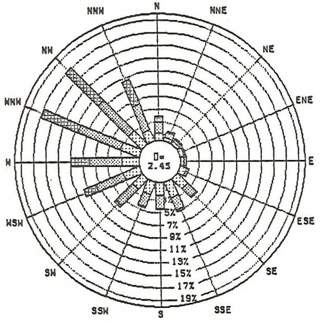




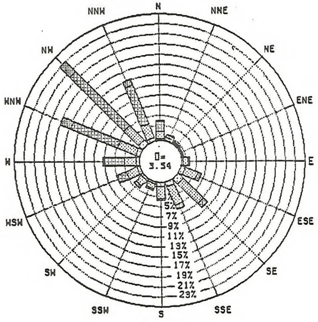
16 POINT
CLIMATOLOGICAL WIND ROSE
FOR ALL STABILITIES
100.00 PERCENT OCCURRENCE



16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY A
2.85 PERCENT OCCURRENCE



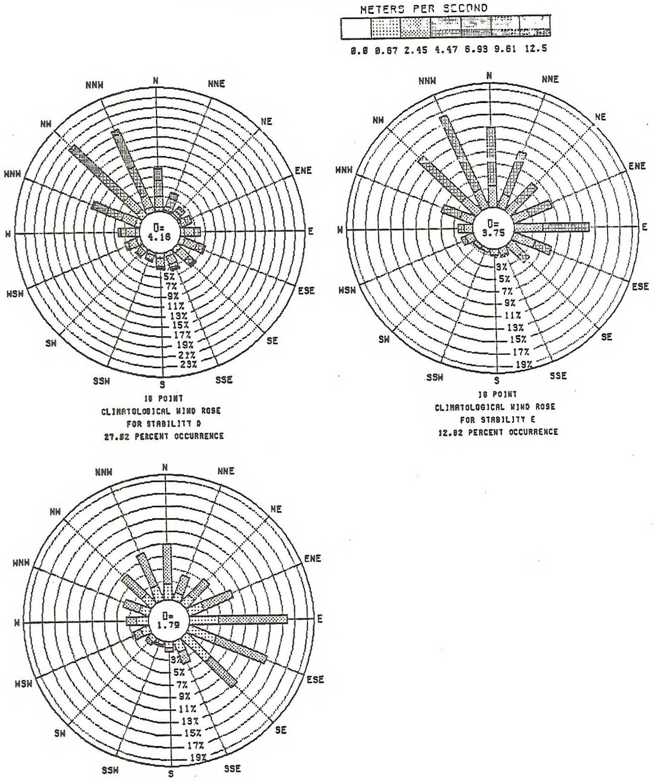
16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY B
12.47 PERCENT OCCURRENCE



16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY C
13.94 PERCENT OCCURRENCE

Figure D—4

BAKERSFIELD/MEADOW SURFACE DATA (1960-64)



16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY D
27.02 PERCENT OCCURRENCE

16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY E
12.82 PERCENT OCCURRENCE

16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY F
30.89 PERCENT OCCURRENCE

Figure D–5
FAIRFIELD/TRAVIS SURFACE DATA (1960-64)

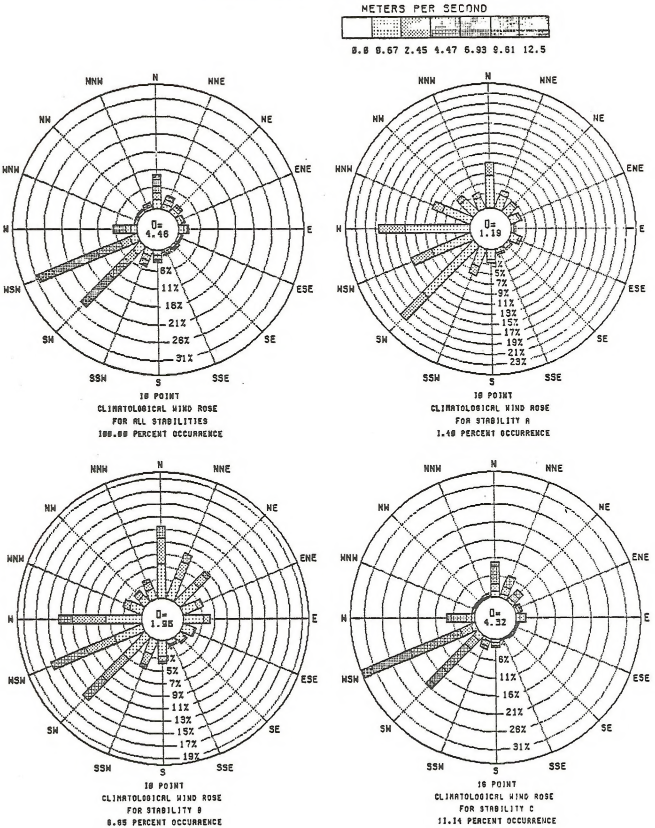
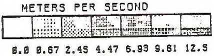
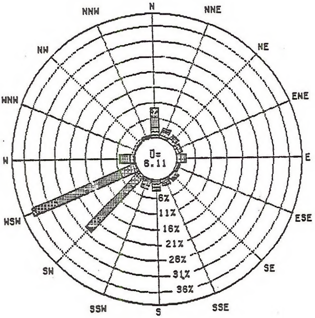


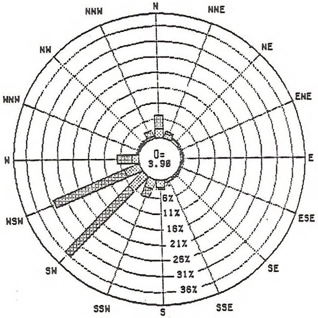
Figure D–6

FAIRFIELD/TRAVIS SURFACE DATA (1960-64)

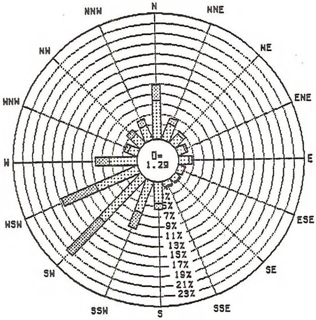




16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY D
52.65 PERCENT OCCURRENCE



16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY E
18.14 PERCENT OCCURRENCE



16 POINT
CLIMATOLOGICAL WIND ROSE
FOR STABILITY F
17.82 PERCENT OCCURRENCE

Table D-2

MEAN MIXING DEPTHS
(meters)

SAN JOAQUIN VALLEY

	Morning	Afternoon
Winter	400	800-1,000
Spring	600	1,600-2,000
Summer	300	1,600-2,000
Fall	300	1,200-1,600
Mean annual	400	1,200-1,600

ALAMEDA AND CONTRA COSTA COUNTIES

	Morning	Afternoon
Winter	453	709
Spring	763	1,121
Summer	527	644
Fall	508	770
Mean annual	563	811

Table D-3

BEST-CASE 10th, MEDIAN, AND WORST-CASE
90th PERCENTILES OF VISIBILITY FOR 1974-1976

Site	Best 10th Percentile	Median Percentile	Worst 90th Percentile
Bakersfield	35	14	3
Fresno	28	13	3
Modesto	46	21	4
Stockton	43	18	4
Concord	45*	24	7

*Based on uncertain nonlinear extrapolation of frequency distribution.

Source: Trijonis, J., Visibility in California.

APPENDIX E

VISUAL RESOURCES

E.1 LANDSCAPE CLASSIFICATION AND VRM MAPS

The great variety of natural and man-made landscape elements are perceived visually as form, line, color, texture, and movement, and the visual landscape within any given area is composed of a distinctive complex of these scenic elements. The individual's perception of visual degradation or enhancement resulting from an alteration of the landscape is based to a large extent on the degree of perceived change in scenic quality created by a change in harmony, variety, or contrast. In addition, policy for landscape management strongly influences individual visual perception; for example, an area managed as park land frequently is considered by many individuals as having higher scenic quality than an adjacent area with essentially similar visual characteristics.

The characterization of the visual landscape must include all of the factors discussed above, including the visual elements of the landscape, perception of scenic quality, and scenic resource management policy. User (or viewer) volume is another important factor in characterizing the sensitivity of a landscape, especially with regard to its alteration. These factors are incorporated into the Bureau of Land Management's Visual Resource Management Program (VRMP) for evaluation and management of visual resources. While the VRMP has been applied only to BLM lands, it provides a useful general method for characterization of visual landscapes as used here, with substantial modification for this report, to describe visual landscapes along the entire route of the proposed pipeline.

In this analysis, Visual Resource Management Classes are used to describe the visual resource quality of the areas through which the pipeline passes. To define Visual Resource Management Classes, two factors, scenic quality and sensitivity level, are considered. Scenic quality is divided into three class designations:

- <u>Class A</u> areas are landscapes with outstanding combinations of scenic elements (landforms, water, vegetation, colors, etc.).
- <u>Class B</u> areas have some landscape elements that are outstanding and some that are fairly common.
- <u>Class C</u> areas have landscape elements that are fairly common in the region.

The VRMP classifies areas also by their sensitivity level, based on the number of users and their perceptions. For this project, user level was determined indirectly by considering proximity to areas of concentrated population and to important highway routes. Important highways were identified based on existing designations in General Plans of the areas through which the pipeline passes. Important highways include major thoroughfares, designated scenic routes, and recreation routes. Land use status was used as an indicator of user perceptions, since visual resources are considered important aspects of the landscape of specially protected areas (such as parks, wilderness preserves, recreation areas) or of specially designated scenic corridors in state, county, and local General Plans. Viewing distance zones, similar to those used in the BLM's VRMP, also were incorporated into sensitivity level definitions. Sensitivity levels for this project are defined as follows:

- High sensitivity: (1) designated areas of special scenic resources (parks, scenic corridors, etc.), and (2) areas containing limited special scenic resources but within proximity of concentrated population areas or having high visibility (foreground/middleground viewing distance) from concentrated population areas and/or from designated scenic routes and vista points.

- Medium sensitivity: (1) areas lacking specific, designated visual scenic resources but located in proximity (foreground/middleground within a viewshed) to such designated areas and, therefore, constituting an integral vista from protected areas; and/or (2) areas that are fairly distant from areas of concentrated population and/or visible only as background features in the landscape when viewed from areas of concentrated population or important highway routes.

- Low sensitivity: (1) areas that are remote from populated areas, major highways, and protected areas, or are seldom seen even as background features of the landscape; and/or (2) areas in any locality that already are severely degraded visually and require rehabilitation or visual enhancement.

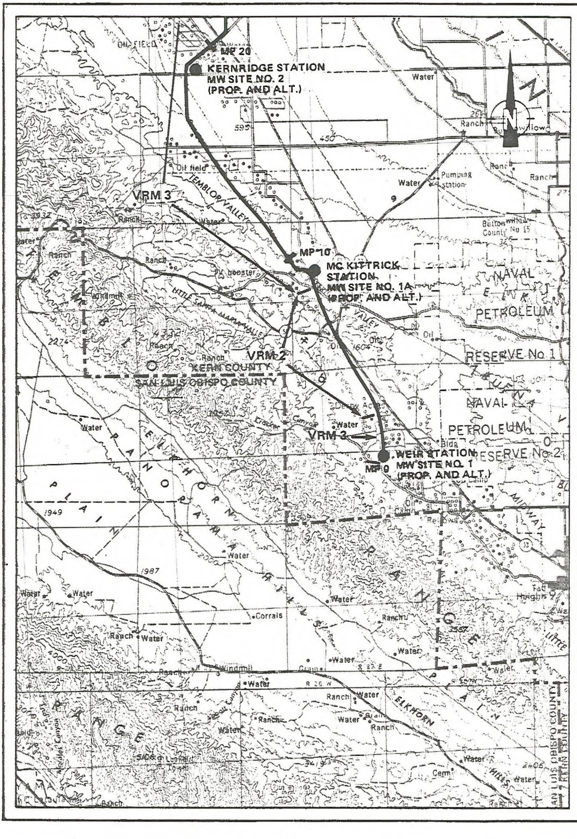
The above scenic quality classes (A, B, or C) and visual sensitivity levels (1, 2, or 3) have been combined in a matrix (see Table 4-19 in Section 4.2.10) showing how the various scenic quality classes and sensitivity levels combine to result in various Visual Resource Management (VRM) classes. The VRM classes are defined below:

- Visual Resource Management Class 1 - Areas of outstanding visual landscapes in which existing management policies allow limited alteration of the landscape. High potential exists for significant visual impact from alteration of the visual landscape. Proposed landscape alterations are likely to be highly controversial.

- Visual Resource Management Class 2 - Areas of mostly common visual landscapes with some outstanding visual resources. Alterations of the visual landscape may be evident and possibly significant. Proposed landscape alterations may be controversial in some areas.

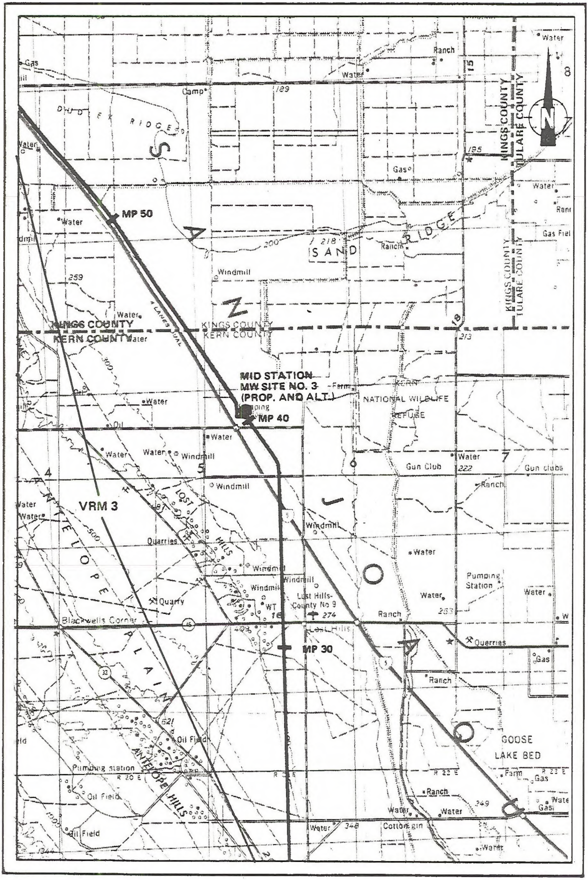
- Visual Resource Management Class 3 - Areas of remote, common visual landscapes or visually degraded areas. Alterations of the visual landscape are not likely to have significant impact or raise significant controversy.

The affected environment is described by these VRM classes below and are shown on Maps 1 through 9 which follow.



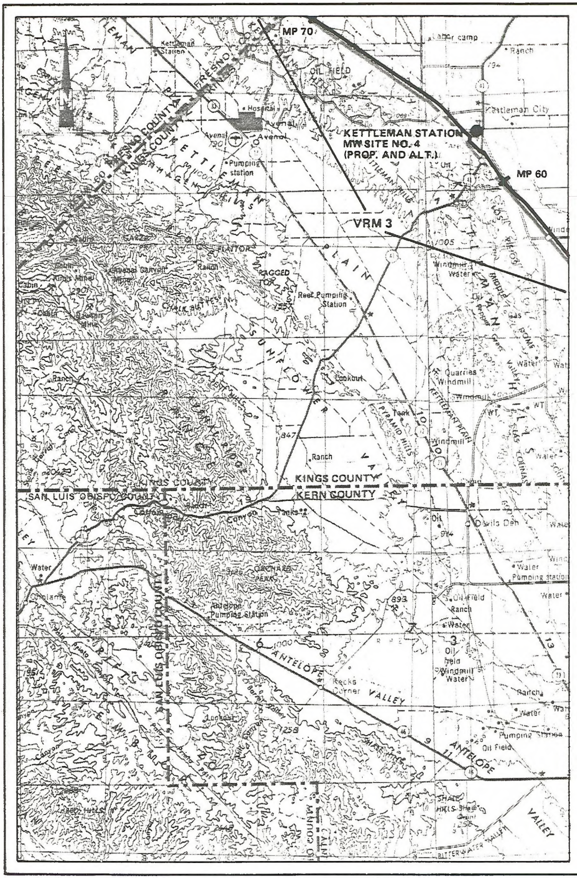
VISUAL RECOURCE MANAGEMENT (VRM) CLASSES

MAP 1

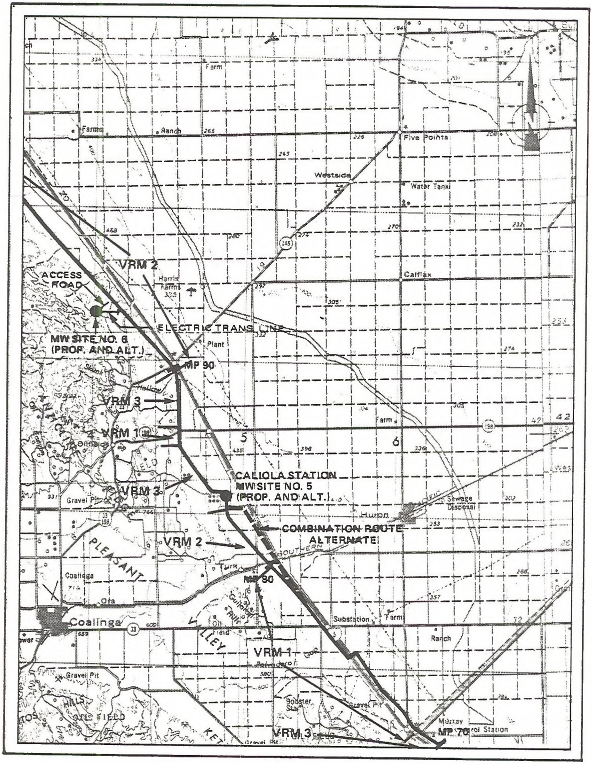


MP 50
KINGS COUNTY
KERN COUNTY
MID STATION
MW SITE NO. 3
(PROP. AND ALT.)
MP 40
VRM 3
MP 30
KINGS COUNTY
TULARE COUNTY
NATIONAL WILDLIFE
REFUGE
SAND RIDGE
LOST HILLS
ANTELOPE PLAIN
ANTELOPE HILLS
GOOSE
LAKE BED
Blackwells Corner
Lost Hills
Gun Club

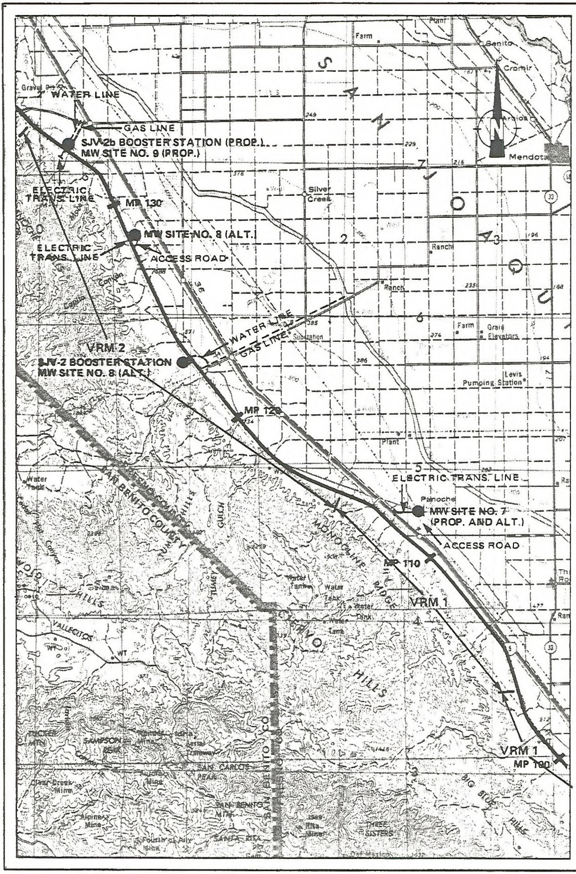
MAP 2


MP 70
KETTLEMAN STATION
MW SITE NO. 4
(PROP. AND ALT.)
MP 60
VRM 3
Kettleman City
KINGS COUNTY
KERN COUNTY
SAN LUIS OBISPO COUNTY
ANTELOPE VALLEY
Kettleman Station
Avenal
Devils Den
Kecks Corner

MAP 3

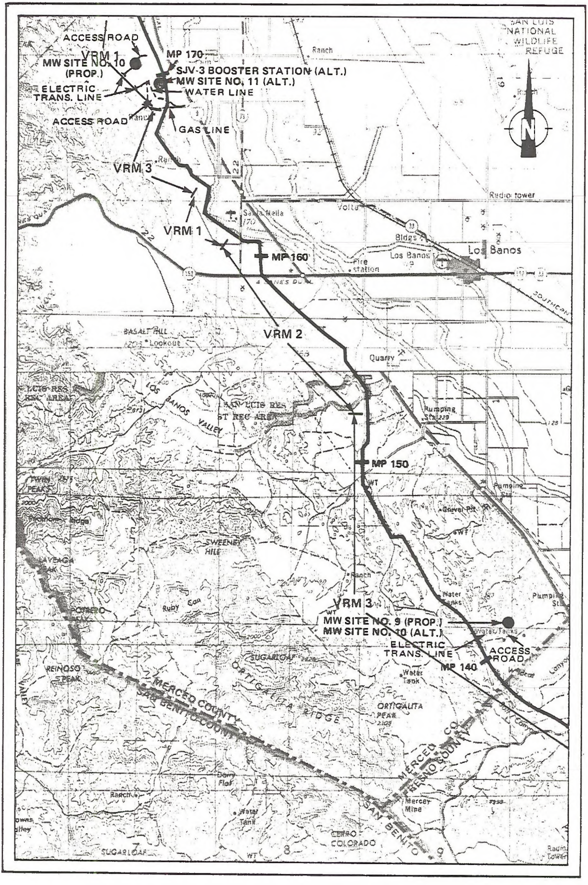

ACCESS ROAD
MW SITE NO. 6 (PROP. AND ALT.)
ELECTRIC TRANS LINE
VRM 2
MP 90
VRM 3
VRM 1
CALIOLA STATION MW SITE NO. 5 (PROP. AND ALT.)
VRM 3
COMBINATION ROUTE ALTERNATE
VRM 2
MP 80
VRM 1
VRM 3
MP 70
Five Points
Westside
Water Tank
Calflax
Harris Farms
Plant
Huron
Sewage Disposal
Coalinga
PLEASANT
VALLEY
Gravel Pit
Substation
Farm
Ranch
Booster Sta
Murray

MAP 4

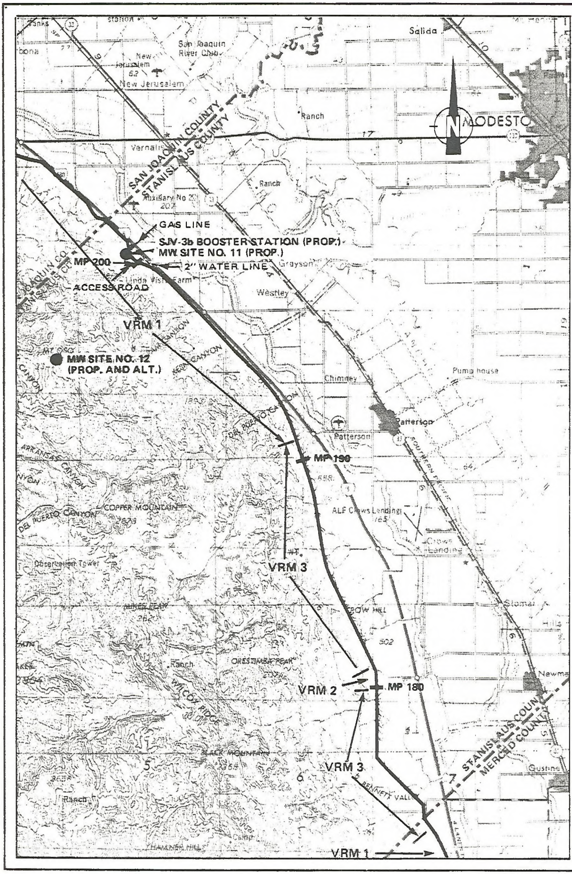


2" WATER LINE
GAS LINE
SJV-2b BOOSTER STATION (PROP.)
MW SITE NO. 9 (PROP.)
ELECTRIC TRANS. LINE
MP 130
MW SITE NO. 8 (ALT.)
ELECTRIC TRANS. LINE
ACCESS ROAD
WATER LINE
GAS LINE
VRM 2
SJV-2 BOOSTER STATION
MW SITE NO. 8 (ALT.)
MP 120
ELECTRIC TRANS. LINE
MW SITE NO. 7
(PROP. AND ALT.)
ACCESS ROAD
MP 110
VRM 1
VRM 1
MP 100
SAN JOAQUIN
Mendota
Silver Creek
Levis Pumping Station
Panoche
SAN BENITO COUNTY
MONOCLINE RIDGE
CIERVO HILLS
BIG BLUE HILLS
SAMPSON PEAK
SAN CARLOS PEAK
SAN BENITO MTN
SANTA RITA
THREE SISTERS

MAP 5

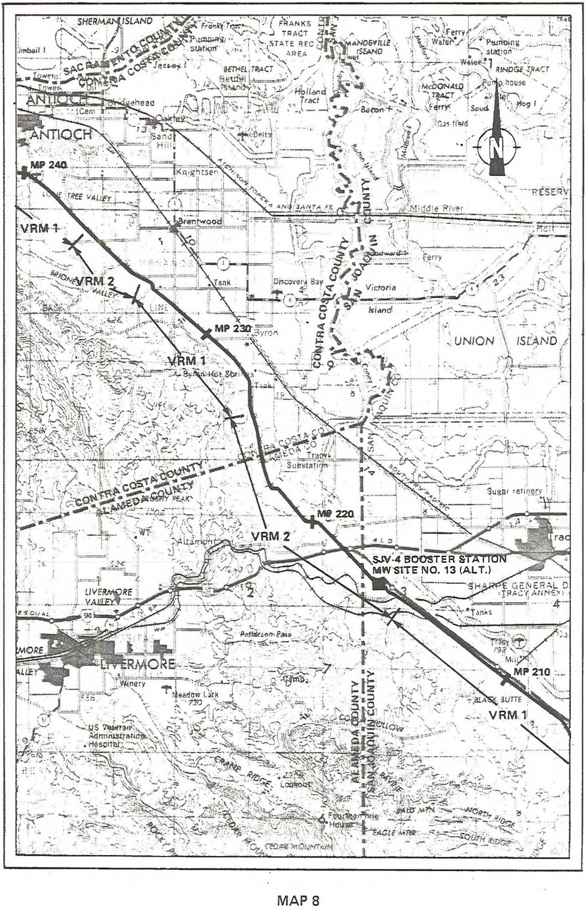

ACCESS ROAD
VRM 1
MW SITE NO. 10
(PROP.)
MP 170
SJV-3 BOOSTER STATION (ALT.)
MW SITE NO. 11 (ALT.)
ELECTRIC
TRANS. LINE
WATER LINE
ACCESS ROAD
GAS LINE
VRM 3
VRM 1
MP 160
VRM 2
MP 150
VRM 3
MW SITE NO. 9 (PROP.)
MW SITE NO. 10 (ALT.)
ELECTRIC
TRANS. LINE
ACCESS
ROAD
MP 140
SAN LUIS
NATIONAL
WILDLIFE
REFUGE
N
Los Banos
MERCED COUNTY
SAN BENITO COUNTY
MERCED CO.
FRESNO COUNTY

MAP 6

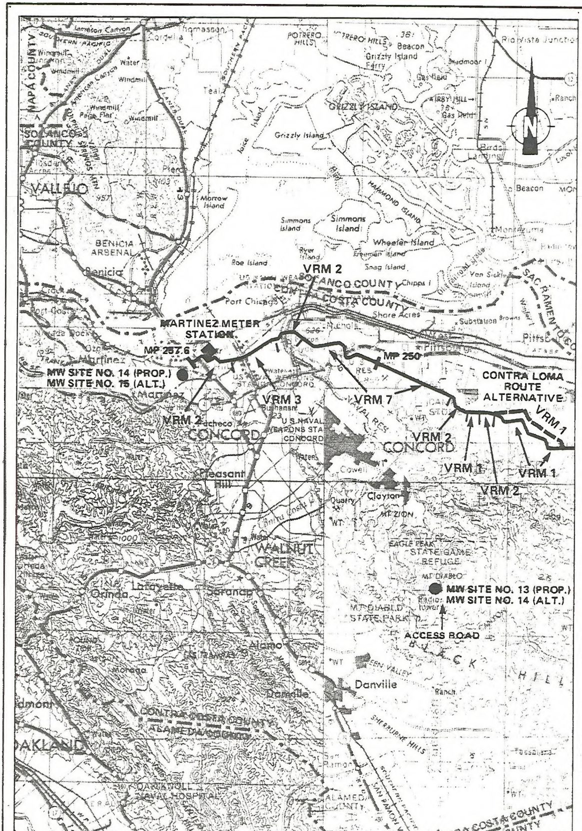


SAN JOAQUIN COUNTY
STANISLAUS COUNTY
MODESTO
GAS LINE
SJV-3b BOOSTER STATION (PROP.)
MW SITE NO. 11 (PROP.)
MP 200
2" WATER LINE
ACCESS ROAD
VRM 1
MW SITE NO. 12
(PROP. AND ALT.)
MP 190
VRM 3
VRM 2
MP 180
VRM 3
VRM 1
STANISLAUS COUNTY
MERCED COUNTY
Salida
Vernalis
Westley
Grayson
Chimney
Patterson
Crows Landing
Newman
Gustine

MAP 7


SHERMAN ISLAND
SACRAMENTO COUNTY
CONTRA COSTA COUNTY
FRANKS TRACT STATE REC AREA
MANDEVILLE ISLAND
BETHEL TRACT
Holland Tract
RINDGE TRACT
McDONALD TRACT
ANTIOCH
Oakley
Knightsen
Brentwood
MP 240
VRM 1
VRM 2
MP 230
Byron
Discovery Bay
Victoria Island
UNION ISLAND
Middle River
CONTRA COSTA COUNTY
SAN JOAQUIN COUNTY
Tracy Substation
CONTRA COSTA COUNTY
ALAMEDA COUNTY
MP 220
Altamont
SJV-4 BOOSTER STATION
MW SITE NO. 13 (ALT.)
Sugar refinery
LIVERMORE VALLEY
LIVERMORE
Patterson Pass
MP 210
ALAMEDA COUNTY
SAN JOAQUIN COUNTY
Meadow Lark
US Veterans Administration Hospital
CRANE RIDGE
Lookout
BLACK BUTTE
CEDAR MOUNTAIN
N

MAP 8


MARTINEZ METER STATION
MP 257.6
MW SITE NO. 14 (PROP.)
MW SITE NO. 15 (ALT.)
VRM 2
VRM 3
VRM 7
MP 250
CONTRA LOMA ROUTE ALTERNATIVE
VRM 1
MW SITE NO. 13 (PROP.)
MW SITE NO. 14 (ALT.)
ACCESS ROAD
N
SOLANO COUNTY
CONTRA COSTA COUNTY
CONCORD
WALNUT CREEK
Danville
Clayton
CONTRA COSTA COUNTY
ALAMEDA COUNTY

MAP 9

E.2 AFFECTED ENVIRONMENT

Extensive VRM Class 1 areas are located along Segment 4 of the proposed route in Contra Costa County. This stems in part from the large concentration of population in the county, including densely populated areas adjacent to the pipeline route in Pittsburg and Antioch. The VRM Class 1 lands along the pipeline route are located predominantly in the scenic hill lands of the Coastal Ranges in Contra Costa County where dense population exits in the immediate vicinity, where important areas have been protected as part of the East Bay Regional Park District, and along numerous scenic roads, trails, and bicycle paths. Elsewhere along the pipeline route, Class 1 areas are located predominantly along designated or eligible scenic roadways.

Areas in VRM Class 2 are located predominantly in Contra Costa County where integral vistas are located adjacent to the East Bay Regional Parks, such as Black Diamond Mines and Contra Loma. The hilly areas of the Coastal Ranges have widespread areas of Class A or B scenic quality. Much of the Class A areas are located in rural settings, fairly remote from population centers. However, use probably is substantial, although concentrated on roads and trails. For this reason, the area has medium sensitivity. The portion of the pipeline near Byron is located in a VRM Class 2 area. The route is located along a major edge feature in the landscape and some segments that are not hidden from view by low hills are in the viewshed of Byron.

In the southwestern part of Stanislaus County, the pipeline route crosses and roughly parallels a designated bicycle route and trends through the designated Lower Orestimba Creek Regional Park site. While this site has some landscape elements that qualify it for a high visual quality designation, a major transmission line corridor trends through the middle of the site. The proposed pipeline route closely follows the transmission line corridor.

In Fresno County, where the pipeline route runs parallel to but about a mile or so distant from I-5, a designated scenic route, the area is considered to be within the integral vista of the highway. Much of the route in the county is Class 2, except where it closely aligns with I-5, where a Class 1 area is located. VRM Class 2 lands are located near small population centers, such as Avenal and Lost Hills.

Class 2 areas in Kings and Kern counties occur near population centers.

Except for the industrialized area near Martinez, VRM Class 3 areas are located predominantly in the southern portion of the study area. In Stanislaus County, west of Patterson and Merced counties, VRM Class 3 areas are located along the pipeline route where it trends parallel to but a good distance west of I-5, a designated scenic route in this area, such that it forms a background element of the visual landscape. The route is located west of I-5 but behind hills that obscure the view from the highway or valley. The area has Class B scenic quality, with numerous transmission lines, and it is a seldom seen area.

Almost all of Kings County and Kern County are Class 3 areas. This is because of a lower scenic quality rating in these areas (Class B and C predominantly) and partly the result of a lower sensitivity rating owing to low population, few scenic roads and trails, and a few localities of degraded visual landscape.

E.3 IMPACT ASSESSMENT METHODOLOGY

The significance of visual impact is grounded in the degree of acceptability of a given important alteration of the landscape to the affected viewers. Under the VRM system, a strong visual contrast must be expected before the impact would be considered unacceptable. A strong visual contrast is defined as one in which the landscape alteration demands attention and will not be overlooked by the average observer.

Given the geography of the study area, the perception of acceptability of a strong visual contrast likely varies widely among the public. The degree of perceived acceptability of a given alteration of the landscape also depends on the relation of that alteration to those visual changes that already have occurred. A proposed landscape alteration in an area that is essentially visually "natural" presents a high degree of contrast and may be unacceptable. In other natural landscapes, a high degree of contrast may be acceptable because the visual alteration would be seldom seen or unimportant to the viewers. In areas that already have some unnatural landscape modification, an additional visual alteration may be regarded as acceptable if the landscape is perceived as already strongly modified, particularly if the landscape is regarded as visually degraded. This occurs in portions of the study area that are industrialized or have numerous roads, transmission lines, structures, or other features that have high levels of visibility. In other cases, an additional alteration of an already visually altered landscape may be viewed as a cumulative impact that is unacceptable. The latter situation often occurs where residents and land managers have adopted visual protection objectives and policies to control further landscape alteration, as in portions of Contra Costa County.

While no common measure of visual impact acceptability exists, it may be reflected to a large extent by sensitivity, as incorporated in the overall VRM class designation for a given area. The VRM class designation (as noted in Section 3.2.10) takes into account both scenic quality and sensitivity. The visual sensitivity levels used in this study were weighted fairly heavily by the existence of established policy or defined objectives for protection of scenic resources in a given land management document, e.g., a County General Plan. Presumably, these policies and objectives were formulated in response to local opinion on the degree of acceptable visual landscape alteration. It is reasonable to conclude that landscape alteration is more likely unacceptable where strong visual contrast of project features in the landscape conflicts with policies established to protect the visual landscape than where no special visual management policies exist. Although visual landscape alteration may be unacceptable in an area lacking visual landscape objectives and polices, this cannot be determined without viewer surveys. In this study, the location of a project feature within the foreground or middleground of the viewshed of existing residences was considered to create at least moderate sensitivity.

The pipeline right-of-way and access roads create primarily a visual alteration by a change in line and color, and to some extent texture in the landscape. The right-of-way can create a change in form if it entails a large cut in the terrain or results in the removal of tall-standing vegetation, such as trees and shrubs. The proposed route trends through few areas with closely growing shrubs and trees, and it cannot be compared to a pathway through woods anywhere along the pipeline route. Like woods, orchards have a significant scenic quality.

Low Visual Contrast

Low visual contrast occurs where the pipeline or an access road would trend: across flat terrain, across cultivated fields, across flat or hilly terrain with numerous roads, transmission lines, and other structures, or along the alignment of an existing road or transmission line. Low visual contrast generally is indicative of insignificant impact.

Moderate Visual Contrast

Moderate visual contrast would occur where the pipeline or an access road would trend: across unaltered hilly or gently sloping grassy terrain with many nearby cultural modifications such as roads, transmission lines, and structures; through hilly grazed or irrigated grasslands; or through urbanized residential areas. Significant impact could occur if the pipeline right-of-way had moderate visual contrast and created a new visual path either within the viewer foreground or middleground of a VRM Class 1 area or very close to residences.

High Visual Contrast

High Visual contrast occurs where the pipeline or an access road would trend: across gradually sloping, hilly, or mountainous terrain with relatively unaltered "natural" scenery, or across orchards in VRM Class 1 areas where removal of the trees would create a distinctive visual path through the surrounding vegetation.

The visual impact of the pipeline is described in this appendix because it is mostly insignificant or significant only during the construction period and for the short-term thereafter, except in areas subject to revegetation constraints, which have been identified in Section 4.2.10.

Areas of potentially significant visual impact during and following construction, until the right-of-way is fully restored and revegetated, are located only in Segment 4 of the proposed route:

- Mileposts 104-116: approximately 12 miles in length;
- Mileposts 168.5-174: approximately 5.5 miles in length;
- Mileposts 192-220: approximately 28 miles in length;
- Mileposts 237-244: approximately 16.5 miles in length;

- Mileposts 245.5-246.5: approximately 1 mile in length; and

- Mileposts 247-254: approximately 7 miles in length.

The pipeline segment from milepost 104 to 116 is located in Fresno County just west of I-5, a designated county scenic highway in this area. The route is located in VRM Class 1 on gently sloping to hilly grasslands and fields mostly within the foreground and, to a lesser extent, the middleground of the highway. The right-of-way would follow an existing pipeline right-of-way for most of its length in this area; this pipeline right-of-way is now fully revegetated and integrated into the visual landscape. Power transmission lines and agricultural fields are located on the opposite side of the freeway.

The pipeline segment from milepost 168.5 to 174 is located near the Merced/Stanislaus county line, in VRM Class 1. The route is located in gently sloping and hilly terrain that rises to the west of I-5, a designated scenic route in this area. It crosses mostly open grassy "natural" hills and some areas of irrigated rangeland. The route is located mostly in the middleground and, to a lesser extent, in the background viewing area of the highway. The California Aqueduct is located between I-5 and the proposed route. Large power transmission lines cross the hillsides and hilltops in the visual background behind the proposed route as viewed from I-5. The proposed route creates a new visual pathway through the terrain within 1/2-mile of the Howard Ranch.

The pipeline segment from milepost 192 to 220 is located in Stanislaus and San Joaquin counties in VRM Class 1, just west of I-5, a designated state scenic highway in this area. The right-of-way closely approaches I-5 and is in the immediate viewing foreground along most of this portion of the route. The pipeline trends very close to the Westley Rest Stop on I-5. The route crosses gently sloping to hilly grasslands. A large power transmission line corridor is located just to the west of the right-of-way in the middleground and background of views from I-5. The proposed right-of-way trends partly along an existing pipeline right-of-way that has become completely revegetated and is well-integrated into the visual landscape. Because of its location in grassland and its close proximity to I-5, the visual contrast would be high and the right-of-way would be highly visible.

The segment from milepost 224.5 to 227.5 is located along the Alameda County/Contra Costa county border. The proposed pipeline right-of-way creates a new pathway through a VRM Class 2, and could have a high visual contrast in the landscape because of potential revegetation failure. The right-of-way traverses a hilly area within the background viewshed of Byron and Byron Hot Springs. It also crosses Camino Diablo Road, a designated scenic route. A number of visual alterations have already been made in this landscape, such as roads and a nearby transmission line. The right-of-way cuts largely across unaltered portions of the local terrain.

The pipeline segment from milepost 235 to 244 is located in Contra Costa County, in the low hills west of Brentwood. The proposed route crosses an area that is located in the background viewsheds of Brentwood and the Black Diamond Mines Regional Preserve. Because of the extensive orchards west of Brentwood, little of the right-of-way is visible from that community. It crosses the foreground and middleground viewsheds of Contra Loma Regional Park and Black Diamond Mines Regional Preserve. A few small portions of the pipeline right-of-way would also be visible in the background viewshed from residential areas in the southern portion of the City of Antioch. In addition, it would cross two designated scenic rural recreation routes: Deer Valley Road and Somersville Road, and closely approach Lone Tree Way, a designated scenic minor thoroughfare. The crossing at Somersville Road is particularly sensitive because that area is one of the main entrances to the Black Diamond Mines Regional Preserve. It also trends very closely parallel to a proposed regional trail of the East Bay Regional Park District. The proposed route crosses low grassy hills west of Brentwood, and steep grassy hills with widely scattered oak trees near Antioch. Lone Tree Valley is flat grassland. The route creates a new pathway across the terrain since it does not closely follow any existing roads or along a transmission line right-of-way. It follows a power transmission line right-of-way for about 1 mile in the hills south of Antioch and a pipeline right-of-way south of the Deer Valley Road crossing at Lone Tree Valley.

The proposed pipeline segment between mileposts 245.5 and 246.5 crosses steep hills to the south of Pittsburg in Contra Costa County. Between mileposts 245.5 and 246.6, the route crosses Kirker Pass Road (also named Railroad Avenue), a designated scenic thoroughfare. The road trends through the bottom of a grassland canyon that appears relatively "natural" in this area, although it is used for grazing. The pipeline right-of-way is located in a small valley hidden by the topography from viewers in the City of Pittsburg. The pipeline right-of-way creates a new pathway that is visible in the foreground of Kirker Pass Road. The route trends parallel to a couple of short unimproved roads in the valley, but represents a new visual feature in the landscape. The pipeline also crosses the channel of Kirker Creek. The pipeline segment immediately to the east of this area closely follows the right-of-way of an existing pipeline in the hills south of Pittsburg, while the segment immediately to the west trends through an area with numerous large power transmission lines.

The segment from milepost 247 to 252 is located in Contra Costa County in the hills west of Pittsburg. The route is located in a highly visible VRM Class 1 hill area that is part of the middleground and background viewshed of Highway 4, a designated scenic route. The pipeline right-of-way also crosses Highway 4, where the impacts would be on the immediate foreground of the highway.

The proposed pipeline segment between mileposts 252 and 254 crosses steep hillsides and hilltops within the middleground view of Highway 4, a designated scenic route. It also is located in the background of the viewsheds of portions of the cities of Concord and Martinez and the middleground viewshed seen from Clyde. The proposed route creates a new pathway in these hillsides, although a portion does trend along an existing pipeline right-of-way. The pipeline segment adjacent to Highway 4 is a new visual feature in the landscape. Numerous features, such as roads and structures, already exist in the valley through which this portion of Highway 4 passes; for this reason, the project has a significant cumulative visual impact.

The impacts of ancillary facilities, either significant or insignificant, will last for the life of the project. For this reason, these impacts have been described in detail in Section 4.2.10.

APPENDIX F

PALEONTOLOGICAL SENSITIVITY CRITERIA

Table F-1

PALEONTOLOGIC SENSITIVITY CRITERIA

As used in this report, the sensitivity of a defined portion of a paleontologic resource depends on the potential of that portion to yield fossils and on the known or expected significance of those fossils to paleontologic research.

For areas outside known fossil localities, the potential has been estimated on the basis of the number, proximity, and stratigraphic relationship of known localities to individual segments of the project right-of-way. Subsequent field investigations may substantially alter these preliminary estimates.

The predicted significance of fossils from an unproven area is based on the kinds of fossils expected, as indicated by the kinds of fossils produced by known nearby localities in the same geologic unit, and on the depositional environment of the sediments in the target area. An expectation of vertebrate fossils generally warrants a high or very high significance ranking, unless similar fossils are unusually abundant in nearby accessible and stratigraphically equivalent localities or unless the potential is low. This follows the significance criteria in most common usage as suggested by BLM memoranda (see Woodward-Clyde 1985, Section 5.2.1).

Significance is further refined in this report by application of guidelines developed during previous investigations (Hanson 1979). These guidelines are listed below for unproven areas with the potential for the occurrence of vertebrate fossils.

A. Uniqueness
    1. Interlocality comparison
        a. Geographic separation from localities of same age
        b. Paleoenvironmental difference from nearest locality of same age
        c. Current status of comparion locality used above (whether destroyed, threatened, or depleted)
    2. Types of publications
        a. Area is in or can be directly correlated to a biostratigraphic type section (standard reference section for fossil faunas)
        b. Area is in or can be directly corelated to a lithostratigraphic (rock unit) type section
B. Diversity of expected information
    1. Taphonomic simplicity
        a. Temporal restriction
        b. Community restriction
        c. Unbiased faunal sample
    2. Associated stratigraphic information
        a. Intradisciplinary - part of stratigraphic sequence of fossil localities
        b. Interdisciplinary - locality includes fossils from different depositional realms or is in stratigraphic sequence with such localities

---

Tabla F-2

ROCK CHARACTERISTICS RELATED TO VERTEBRATE FOSSIL POTENTIAL

The following guidelinea have been used to infer tha potential for production of terreatrial, non-aquatic vertebrata fossila in rocks of unknown productivity. One or more very unfavorable conditiona generally preclude fossila. Horizontal arrowa indicate continuum of conditiona and favorability.

FACTOR	CONDITION: Favorabla	Neutral	Unfavorable	Very unfavorable	COMMENTS
Basic rock type	Sedimentary rocka	--	Low-grade meta-aedimenta	High- grade meta-morphic, igneous rocks	Metamorphic, igenous rock-forming processas deatroy organic remains.
Sedimentary envi-ronment	Fluvial (channel or floodplain)	Loess	Airfall pyroclastic sediment	Ashflow tuff Mudflow	Fluvial, lacuatrine envi-ronments have high dena-ity of animala and are areas of moderately rapid sedimentation.
	Delta				
	Ephemeral lake bed, pond, oxbow	Perennial laka bed*			Airfall tuffs may produce well-preserved but widely scattered specimens near base.
	Distal alluvial fan ←	———	→ Proximal alluvial fan	Talua	
	Spring	Swamp, marah		Glacial till	Conditiona of ashflow, mudflow, and glacial till deposition tend to destroy remains.
Paleoclimate	Cool	Temperate	Warm		Bone deterioration rapid in warm, humid conditions (more bacterial action, leaching).
	Arid ←	———	→ Humid		
	Seasonal or spora-dic rainfall		Rainfall weakly seasonal, few flooda		Episodic flooding concen-tratea, buries accumu-lated bones.
	Occasinal drought				

Table F-2 (Cont.)

FACTOR	CONDITION: Favorable	Neutral	Unfavorable	Very unfavorable	COMMENTS
Modal clast size	Sand, silt	Pebbles Clay (allo-genic)	Cobbles	Boulders	Very large clasts imply high-energy transport, bone destruction.
Size sorting of clasts	Poor to very poor sorting	Moderate sort-ing	Good sorting	--	Bones hydraulically dif-ferent from rock clasts; often excluded by condi-tions which sort rocks.
Clast composition	Arkosic ←	———	→ Pure quartz or with dispersed clay	--	High quartz or clay con-tent often implies intense weathering, warm humid conditions.
	Rhyolitic volcani-clastic	Andesitic volcaniclastic	Basaltic volcani-clastic	--	Empirical; low-silica volcanics disfavor pertri-faction (?)
	Clay pellets	--	--	--	Clay pellets comparable in density to bone and con-centrated by similar hydraulic conditions.
Secondary colors (post-depositional)	Subdued colors: Light green, green-ish gray, buff, reddish or yellow-ish brown to brown, light gray, blue-gray	Pastel colors: Mauve, pink, light yellow	Strong colors: Yellow, red	Intense colors: Dark red, maroon, orange	Secondary color intensity reflects weathering, oxi-dation intensity.

Table F-2 (Cont.)

FACTOR	CONDITION: Favorable	Neutral	Unfavorable	Very unfavorable	COMMENTS
Secondary minerals	Calcareous, siliceous, or hematitic concretions Caliche Phosphate nodules	Gypsum	--	--	Bones often act as nucleus for formation of concretions. Secondary mineralization of sediments implies availability of dissolved minerals which may petrify bone.
Predominant bed thickness	5 to 20 cm	20 cm to massive 1 to 5 cm	Less than 1 cm*	--	Moderately thick layers of sediment protect underlying bones without diluting bone concentration.
Bedding type	Lenticular Large-scale cross bedding (channel, point bar) Planar (fine sediments)	Small-scale cross bedding Indistinct to massive	Laminated*	--	Bones often concentrated in channel beds or point bars or preserved in floodplain deposits.
Lithologic variation	Heterogeneous ◄	————	► Homogeneous	--	Heterogeneous liths imply variety of local environments, possible unusual local depositional conditions favoring bone concentration, preservation.

Table F-2 (Cont.)

	CONDITION				
FACTOR	Favorable	Neutral	Unfavorable	Very unfavorable	COMMENTS
Associated non-vertebrate foasils	Calcareoua invertebrate shella	Comminuted, carbonized plant fragments	Well-preserved leaves, petrified wood	--	Empirical; acidic conditions favorable to plant preservation generally unfavorable to bone.

*Small aquatic vertebrate fossila often associated with these conditions.

BLM Library
D-553A, Building 50
Denver Federal Center
P. O. Box 25047
Denver, CO 80225-0047